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Source: Tropical Conservation Science, 4(3) : 244-253

Published By: SAGE Publishing

URL: <https://doi.org/10.1177/194008291100400302>

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Opinion Article

Reel conservation: Can big screen animations save tropical biodiversity?

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Abstract

Outreach and education on conservation issues are crucial elements of successful conservation programmes. Big screen animations have a global reach, yet are not fully capitalised by conservationists and there remains great potential in developing them into powerful biodiversity and conservation education outreach tools despite known shortfalls and limitations in scientific value. We reviewed recent major animated features with multiple conservation themes (e.g. extinction, wildlife trade, ex-situ conservation) and that especially feature tropical biodiversity, especially endemics, charismatic flagships or threatened species in authentic natural settings. We acknowledge that while the potential to develop them into effective biodiversity and conservation education tools is undoubted and there are recent examples, there is a crucial need to complement them with supporting educational materials, campaigns and activities. Partnerships between the animation studios, conservation NGOs and local stakeholders will be integral to effect this.

Key Words: Animations, tropical biodiversity, conservation awareness, education, outreach, flagships

Received: 20 May 2011; Accepted: 28 June 2011; Published: 19 September 2011.

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Cite this paper as: Yong, D. L., Fam, S. D. and Lum, S. 2011. Reel conservation: Can big screen animations save tropical biodiversity? *Tropical Conservation Science* Vol. 4(3):244-253. Available online: www.tropicalconservationscience.org

Introduction

The present century is afflicted with a human-accelerated global extinction crisis, spurred by synergies of drivers ranging from tropical deforestation, climate change to invasive species and the wildlife trade [1]. Efforts to preserve biodiversity, especially in the world's tropics where biodiversity is most concentrated, designing both in-situ and ex-situ programmes at varying scales form key conservation priorities of conservation non-governmental organisations with a number of international NGOs (e.g. Conservation International, Wildlife Conservation Society, World Wide Fund for Nature) taking the lead [2, 3, 4]. Conservation biologists, organisations and governmental bodies have acknowledged the importance of social marketing by generating awareness and outreach across the wider population to enhance the effectiveness of conservation programmes [5, 6, 7], so as to stimulate cooperation and conservation action [8]. However, despite a significant proportion of the conservation dollar is being expended on outreach programmes with Conservation International alone spending nearly \$14.5 million in 2009 [9], the continuing loss of biodiversity globally means that more effective outreach avenues are clearly needed. Given the ability of big screen animations to appeal to a large global audience, how viable is the animation industry as a medium to impart urgently needed biodiversity and conservation-related knowledge to the masses?

The American animation feature industry, with its key players including Dreamworks Animation, Disney-owned Pixar Animation Studios and 20th Century Fox produce a number of highly grossing, award-winning animation feature films annually (Table 1). These garner large viewerships not only in the USA with its estimated 1.36 billion admissions in 2008 [10], but are also consumed by populations in developing countries across the tropics (e.g. Brazil, Peru, Indonesia and the Philippines) where some of the most critical biodiversity and conservation issues are unfolding [11, 12], accentuated by diverse socioeconomic problems like poor governance [13]. A number of these animations narrate fictitious storylines using animal characters set in natural environments across varying timescales. Recent examples include *Kungfu Panda* and *Madagascar*, both of which spawned a number of sequels are among the top 20 most watched films worldwide [10]. Furthermore, while some of these animations like *Rio* and *Happy Feet* played host to well-known conservation issues [14], others like *Kung Fu Panda* and its sequels used animal characters based on real, threatened species but placed in man-made settings.

The concept of animations with conservation, ecological or broad environmental themes is not novel and dates back to the 1940s with Walt Disney's *Bambi* to the pivotal screening of *FernGully: The Last Rainforest* at the 1991 Earth Summit in Rio de Janeiro, which became an icon of the global environmental movement [15, 16, 17]. While many of these animations had implicit ecological nuances, others explicitly draw attention to the environmental issues as their primary focus [16], most notably *Avatar* which came under intense scrutiny by conservationists and the mass media [18, 19]. Surprisingly, the potentials of utilising animation as tools in environmental communication is little addressed in the larger context of environmental media [16], with news and documentaries getting the bigger share of academic attention [20]. Even where discussed in research, only the sociological and cultural impacts of these films are evaluated [15]. At first glance, these animations usually feature varying combinations of two broad themes: contemporary conservation issues and the use of characters based on real, charismatic flagships, endemic or threatened species (Appendix 1).

Table 1. List of recent animations that featured tropical biodiversity or contain broad environmental/ecological themes, and respective worldwide gross

Feature animation	Production studio	Year of release	Estimated worldwide gross (in USD)
<i>Animations that feature tropical biodiversity</i>			
Finding Nemo	Pixar Animation	2003	865 000 000
Madagascar	Dreamworks Animation	2005	406 800 000
Kungfu Panda	Dreamworks Animation	2008	633 395 021
Madagascar: Escape to Africa	Dreamworks Animation	2008	594 082 968
Animals United	Constatin Film Productions	2010	No information
Rango	Blind Wink Productions	2011	240 707 194
Rio	Blue Sky Studios	2011	470 075 082
Kungfu Panda 2	Dreamworks Animation	2011	531 281 396
<i>Animations that contain broad environmental or ecological themes</i>			
Ice Age: The Meltdown	Blue Sky Studios	2006	623 829 763
Happy Feet	Warner Bros Pictures	2006	378 992 827
Bee Movie	Dreamworks Animation	2007	283 197 121
The Simpsons Movie	Twentieth Century Fox	2007	525 532 370
Avatar	Twentieth Century Fox	2009	2781 505 847*

Data from IMDB database [42] accurate as of 1 July 2011

* Highest recorded box office gross for a film

The use of animation characters in the media based on known flagship species, many of which are threatened, is a powerful tool in driving conservation interest [21] by evoking positive emotions towards the local environment [22]. In cases this can convey ecological awareness of selected species and their conservation needs to a large citizenry, many who are detached from biodiversity and conservation issues [20] or possess only superficial knowledge [23]. *Rio* and *Madagascar* are both excellent examples because both animations have their settings and habitats authentically featured based on known biodiversity hotspots, the Atlantic forest in Brazil, and Madagascar respectively [11, 24]. Conversely, *Kung Fu Panda* used characters identifiable to species, based on a number of charismatic flagships, globally threatened or endemic species (e.g. giant panda, snow leopard, South China tiger) that occurs in China's biodiversity hotspots, Sundaic South-East Asia (e.g. Javan rhinoceros) and Indo-Burma (e.g. Gee's golden langur) [24] (Fig. 1). Likewise, *Rio* and *Madagascar* featured numerous species relevant to the habitats it portrayed. In *Rio*, typical Brazilian species like the common marmoset, red-crested cardinal and Toco toucan are featured. In *Madagascar*, a number of endemic mammals, especially lemurs (e.g. aye-aye, ring-tailed, mouse and ruffed lemurs), and their natural predator, the globally threatened fossa are featured [25] (Fig. 1).

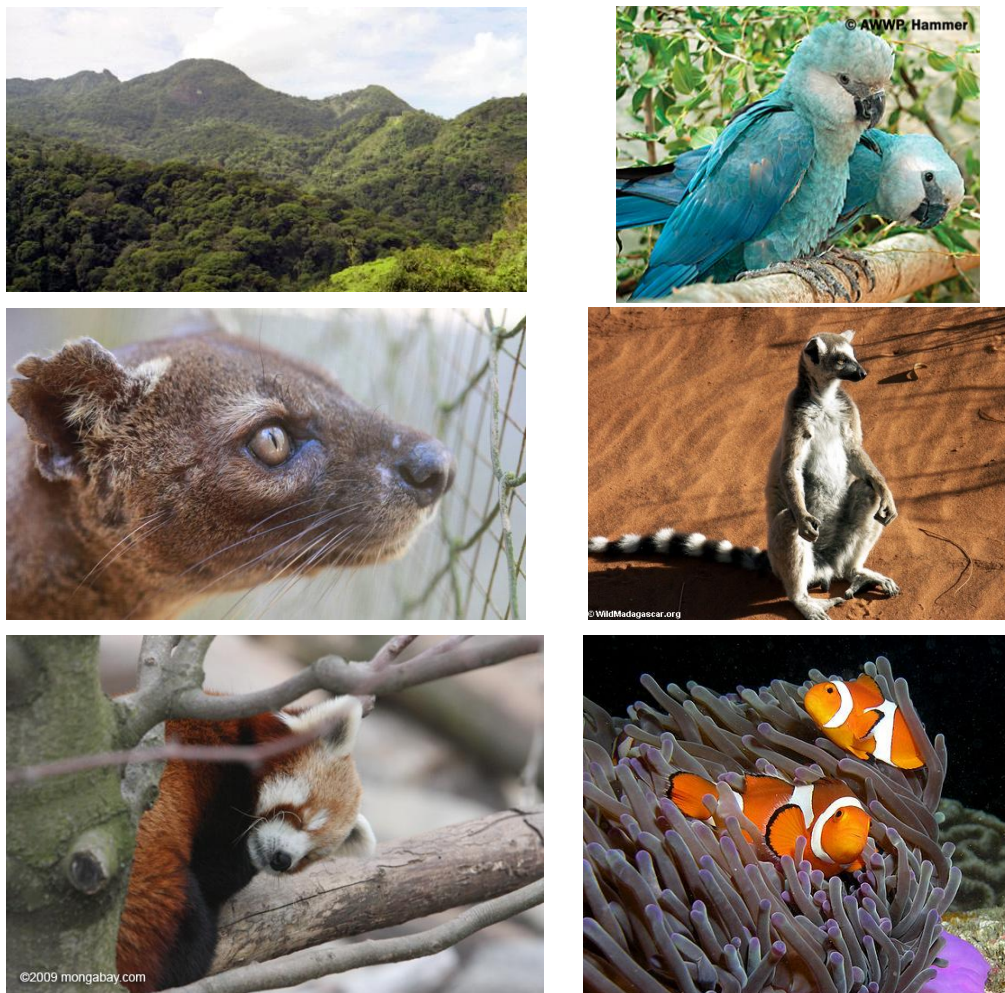


Fig. 1. (Top Left) Brazil's Atlantic Forest, featured in *Rio*. (Top Right) Spix's Macaw (*Cyanopsitta spixii*), featured as the main character in *Rio*. (Centre Left) Fossa (*Cryptoprocta ferox*) is mentioned in Madagascar but not featured. (Central Right) Ring-tailed Lemur (*Lemur catta*), featured in Madagascar. (Bottom Left) Red Panda (*Ailurus fulgens*), featured is one of main characters in *Kungfu Panda*. (Bottom Right) Ocellaris Clownfish (*Amphiprion ocellaris*), featured as the main character in *Finding Nemo* (Wikipedia.org).

Secondly, instead of merely featuring known charismatic or threatened species, some of these animations weave explicitly into their storylines contemporary conservation issues. The advantage of this is that it subtly conveys to its audience major issues in biodiversity conservation that the audience is largely unfamiliar with. These animations potentially trigger considerable interest across a broad viewership and can form the starting point of biodiversity and conservation knowledge. In these respects, besides conveying knowledge on Neotropical biodiversity, *Rio* with its Atlantic forest setting, also highlights real conservation issues like the highly lucrative international wildlife trade that is driven by illegal syndicates. Its allegorical feature on the critically endangered, Spix's Macaw (*Cyanopsitta spixii*) which may be already extinct in the wild [26] due primarily to the antagonists featured in the movie (e.g. wildlife trade) relates directly to real problems faced in ex-situ conservation and species reintroduction programmes. Likewise, other animations like *Finding Nemo* and *Happy Feet* draws attention to pertinent marine conservation issues like impacts of illegal harvesting of marine animals for the pet trade, marine pollution and overfishing [14] besides accurately portraying biodiversity in Antarctica and the Great Barrier Reef respectively.

One of the commonest criticisms of the mass media in communicating conservation or biodiversity-related messages is that it misrepresents, inaccurately depicts contents or in cases, sensationalises [17, 20]. Ironically, this frequently occurs alongside efforts by filmmakers to achieve accuracy in portraying animals [15] and their environment. For instance, the settings portrayed in animations too often are idealised and *Rio* and *Madagascar* for one, conveyed the impression that the Atlantic forests of Brazil and Madagascar's native vegetation remained respectively in their pristine state when deforestation and fragmentation has reduced natural habitats in these hotspots into small patches in a mosaic of a larger human-modified landscape [24, 27, 28]. Similarly, although the recent award winning animation *Up* portrayed South America's wild Tepui landscape fairly accurately, its depiction of native biodiversity is largely fantasy, unbeknownst to the wider audience. Other animations like *Ice Age* accurately depicted many prehistoric mammal species (e.g. giant ground sloths), but might have misled viewers into believing that long-extinct dinosaurs exist simultaneously with Pleistocene mammals! Clearly, the issue of misrepresentation is real, frequent and sets the educational value of many animations a major step backwards considering the fact that a large proportion of the audience are likely to have limited prior knowledge of natural history, biodiversity or conservation biology.

A secondary problem that has received limited research attention is the influence on the wildlife trade driven by the media at large, particularly animations featuring animals. As much as animation and film productions can educate on biodiversity, we recognise pertinent social impacts of these productions on their audience. For example, media productions can influence their audience's desires to be acquainted with animals featured as characters in them due to their 'cute' appeal, thus the 'bambi syndrome'. Non-animation features like the *Jurassic Park* movies [29] and the cartoon series *Teenage Mutant Ninja Turtles* [30] were reported to be linked to massive spikes in public interest in keeping green iguanas and red-eared sliders as pets [31, 32], and implicate the influence of media productions on the pet trade, as are wider socioeconomic factors. Furthermore, other examples have also shown that media productions, including animations drive mass appeal such that interest is primarily in the characters portrayed and not implicit conservation messages. This mass appeal ironically threatens the very species (e.g. owl trade in India linked to *Harry Potter* movies) and nullifies any conservation messages these animations attempted to portray (e.g. increased demand for clownfish in the pet fish trade after *Finding Nemo*) [33, 34]. While further research is needed to clarify the magnitude of these problems, it underlines the influence of animations on the wildlife trade and that film producers may have to acknowledge and take some responsibility in pre-empting and mitigating any conservation backlash that arise.

Another undesirable side-effect which has arisen from ecologically-themed animations and which has been the subject of much debate is their tendency to oversimplify complex conservation issues, and that ideologies rather than science is being communicated [16]. The recent animated feature *Avatar* well exemplified this problem despite being one of the most highly grossing movies, and the praises heaped upon it as a conservation-themed blockbuster [18]. Although the setting wreaks fantasy, putting humans 'in conflict with an alien tribe on a distant planet', it allegorically portrays a classical environmentalist's dichotomy of exploitative corporations pitted against oppressed, conservation-conscious rainforest-dwelling tribes. As

argued by Meijaard [19], the notion of a conservation-practicing native which does not impact the environment is already debatable, given an established body of evidence of megafauna extinctions driven by the 'ecologically-noble savage' [35]. Clearly, current conservation problems throughout the tropics is not merely a dichotomy of exploitative corporations and 'conservation-minded natives', but needs to take into consideration people who make a living from biodiversity, as is a myriad of other stakeholders ranging from local governments, conservationists, agriculturalists on top of indigenous people.

Some critics of the mass media's role in promoting awareness of conservation and biodiversity have questioned the intent of movie producing studios, arguing that animation producers are primarily profit-driven, and it is possible that conversely, conservation themes are being capitalised upon by film producers. Although the extensive advertising and ticket sales lend some credence to this [10], it does not hide the fact that animated productions have far-reaching influences on viewers, possibly more so than other forms of mass media like wildlife documentaries or the news although evidence is lacking. On the contrary, the number of animations which contained biodiversity or conservation themes, some of which may not have clear conservation intents, offer conservation spin-offs that could be capitalised by conservationists as tools to educate on native biodiversity and its conservation. Furthermore, collaborative efforts between Conservation International and Dreamworks Animation to produce animations like *Kungfu Panda* and *Madagascar* indicate that conservation NGOs can form successful partnerships with animation studios to educate movie-viewers on biodiversity [36, 37], and that some animations at least are made with clear conservation intentions.

Although empirical studies on its effectiveness as a conservation outreach tool is still lacking, what is clear is that animation productions are able to rapidly appeal to the interest and popularity of large audiences across different age groups and socio-cultural backgrounds. Similar popular approaches to conservation using songs by well-known singers and animal mascots have also shown considerable success, highlighting their effectiveness [38]. For instance, *Finding Nemo* has appealed well to students in the United States and has even been used in development of teaching materials for marine biology themed science lessons [39] using tropical reefs as the focus. *Yesterday's Zoo*, a recent private short animation production is another example [40], and again demonstrates the fact that careful marketing of pertinent conservation issues, in this case biodiversity loss, can be effected using a combination of complementing materials in a grassroots campaign targeted at children, and made freely available to conservation organisations. Given these successes, it is very plausible for many big time animations to be complemented with follow-up educational activities and materials, which can be carefully designed by conservation NGOs to be later used in outreach and partnership programs.

Ironically, in spite of increasing admissions globally [10], many movie-viewers in developing tropical countries may still lack direct access, or exposure to relevant conservation literature or materials featuring their own biodiversity. Given these respects, the potentials of using animations as tools to convey knowledge of biodiversity and conservation issues to the masses remain to be tapped. The use of complementing materials (e.g. leaflets, documentaries and lesson plans featuring biodiversity in the regions) and activities (e.g. workshops, seminars) to go hand-in-hand with these animations is necessary, and can be funded and produced by large

conservation NGOs working closely with local community stakeholders to reinforce and clarify the information conveyed in the animations, as well as to build local capacity. Close collaboration between NGOs and animation production studios at various stages of production before release will be needed to explore avenues for marketing, where conservation themes may be highlighted in relation to, or linked with animation content.

The advent of multidimensional computer generated graphics means that animation studios are now able to infuse realistic elements into animated productions, reinforcing its popular appeal. The potential to generate outreach for tropical biodiversity and drive the education of urgent conservation issues using popular animation remains immense, as seen in examples like Butler [40], but is still limited and currently not well capitalised by conservationists although local examples do exist (e.g. *Geng: The Adventure Begins* in Malaysia, *Khan Kluiay* in Thailand) and may be increasing. Clearly, conservation NGOs would do well to first establish partnerships with animation studios, as well as local stakeholders [41] such as local movie distributors, government agencies and schools to develop effective outreach programs integrating content from these animations with conservation science. Conservation themes and featured biodiversity, including less charismatic species that have been woven into storylines should be clearly interpreted and explained, and these outreach resources made widely available to libraries, educational institutions and local communities. While animations alone cannot save the world's fast disappearing tropical biodiversity nor afford comprehensive representations of complex conservation issues, their use as outreach tools, complemented by carefully designed outreach programs can go a long way into communicating much needed awareness and knowledge of biodiversity and basic conservation science to a vast cinema-going audience worldwide that conservationists cannot do without, and clearly not with scientific journals.

Acknowledgements

We are grateful to L.P. Koh, N.S. Sodhi, S. Atsalis and Y.E. Lim for their comments on an earlier draft which improved the manuscript greatly. D.L. Yong would like to single out the late N.S. Sodhi for invaluable guidance, and inspiration to pursue conservation, and research in the conservation sciences. We also thank D.N. Cooray and B.W. Low for helping to source for some of the cited materials. Lastly, we would like to thank three anonymous referees for their input which improved our manuscript greatly.

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Appendix 1. List of five recent animations mentioned in text featuring biodiversity and containing identifiable conservation themes

Animation / Studio	Sequel(s) and Year Released	Habitat /Location	Country	Key species portrayed	Conservation/biodiversity theme
Ice Age (20 th Century Fox)	Ice Age (2002) Ice Age 2: The Meltdown (2006) Ice Age 3: Dawn of the Dinosaurs (2009) Ice Age 4: Continental Drift (2012)	Mixed grasslands and forest	N.A.	Woolly Mammoth Sabre-toothed Cat Giant Ground Sloth <i>Glyptodon</i> sp.	1. Mammalian evolution; 2. Ice age fauna and vegetation; 3. Climate change (Ice Age 2); 4. Continental drift (Ice Age 4)
Finding Nemo (Pixar Animation Studios)	2003	Coral Reefs (Great Barrier Reef)	Australia	Ocellaris clownfish Pacific Regal Tang Green Sea Turtle* Great White Shark* Hammerhead Shark sp.* Mako Shark sp.* Pacific Cleaner Shrimp	1. Coral reef diversity; 2. Coral reef ecology; 3. Illegal harvesting of marine animals for pet trade; 4. Unsustainable fishing industry/overfishing; 5. Impact of ocean currents on marine migration
Madagascar (Dreamworks Animation)	Madagascar (2005) Madagascar: Escape 2 Africa (2008)	Tropical savannah (Tanzania), Spiny forest (Madagascar) Tropical rainforest (Madagascar)	Tanzania, Madagascar	Ring-tailed lemur* Ruffed lemur sp.* Mouse lemur sp. Aye-aye* Fossa* Ocelot gecko Drouhard's shrew tenrec	1. Endemic species in Madagascar; 2. Biodiversity hotspots; 3. Damming impacts on biodiversity; 4. Wildlife conservation beyond boundaries of reserves; 5. Ex-situ conservation (zoos) and the propensity of zoos to use wild animals for entertainment; 6. Wildlife re-introduction programmes
Happy Feet (Warner Bros)	2006	Ice shelves, open sea (Antarctica)	N.A	Emperor penguin Adelie penguin Rockhopper penguin sp.* Leopard seal Southern elephant seal	1. Antarctic biodiversity and ecosystems; 2. Impacts of overfishing on marine food chains; 3. Marine pollution
Rio (20 th Century Fox)	2011	Tropical rainforest (Atlantic forest)	Brazil	Spix's macaw* Toco toucan Red-crested cardinal Common marmoset Various macaw sp.	1. Endemic species in the Atlantic forest; 2. Biodiversity hotspots; 3. Global wildlife trade (tropical birds); 4. Wildlife reintroduction and captive breeding programmes; 5. Species extinction and threatened species

* Species listed as globally near-threatened or threatened according to IUCN [43]