Ex situ management of ASAP Species

Participants

Alessandro Badalotti, Anne Baker, Adolfo Castro, Juan Cornejo, Camille Coudrat, Aparajita Datta, Danny de Man (convenor), Candice Dorsey, Nicole Duplaix, Biswajit Guha, Wichit Konghkam, Urarikha Kongprom, Kristin Leus, Sonja Luz (convenor), Jansen Manansang, Tiit Maran, Michael Meyerhoff, Thai Nguyen, Kaori Ota, Olivia Petre, Roopali Raghavan, Radoslaw Ratajszcrah, William Robichaud, Johanna Rode-Margono, Saowaphang Sanannu, Karin Schwartz, Christoph Schwitzer, Brandon Speeg, Kathy Traylor-Holzer (convenor), Tjerk ter Meulen, Ampika Thongphakdee, Eric Tsao, Vicki Guthrie, Daniel Willcox, Yonathan Yonathan

Introduction

The aim of this working group was to discuss the *ex situ* needs for ASAP species and the potential requirement for a more pro-active strategy for *ex situ* management approaches. Integrated and professionally managed *ex situ* programs of threatened species can substantially support conservation efforts, and many notable examples exist in which *ex situ* facilities like zoos have helped to save species from extinction. For the 175 Critically Endangered ASAP species an *ex situ* working group (ESWG) is established, which is currently trying to better understand needs, opportunities and constraints for *ex situ* management of ASAP species specifically. The outcomes of this workshop provide important input that will help the ESWG further develop it final strategies and procedures.

Process

A brief introduction to ASAP species in *ex situ* management was shared with all participants (*Refer Appendix 1)*. Currently 118 species may have no individuals that are managed in captivity and 57 species are known have individuals in captivity. Of these, 31 species seem to have integrated conservation programs but for 26 species that are currently in captivity, there is uncertainty regarding links with *in situ* conservation programs.

Prior to the start of discussions, all participants were asked to list:

I. Challenges and risks of proactive approaches to ex situ management of ASAP species that are not yet managed in captivity; and
II. Challenges with evaluating “quality” of ex situ programs in regard to their connection/contribution to in situ conservation.

The points covered in these discussions have been presented in *Appendix 2*.

A quick introduction to the IUCN *ex situ* guidelines and the ICAP process was also shared with all participants. Participants were divided into two groups to discuss:

Participants were divided into two groups to discuss:

a. What justifies bringing individuals into captivity?
b. What are the challenges, risks and feasibility of doing so?
c. What are the processes and steps needed to do so?
d. How do we best seek agreement with relevant stakeholders?

Similarly, for ASAP species that do currently exist in captivity:

a. What criteria should be used to decide whether they are a priority for *ex situ* conservation management?

Results

For ASAP species that are currently not in captivity:

1) What justifies bringing ASAP species into captivity?
    - The benefit has to outweigh the risks, and there has to be a way to evaluate the feasibility.
    - The species has no chance in the wild.
    - Being assessed as Critically Endangered (CR) means it should need an assurance colony. If a species is listed as CR then it doesn't have any chance to recover in the wild.
    - Smaller species are easier; should we prioritize them?
    - Look for opportunities, e.g. is there a species champion, is there already a project, are they captured through trade?
    - Already Critically Endangered so best to do it, rather than wait until it's too late, as long as you can ensure that whatever you remove will not negatively affect the wild population.
    - Some species on the list have not been sighted in the wild for many years and could be extinct (a couple of amphibians, kouprey, one of the birds) and should not be prioritized or given key focus.
    - Should we consider species uniqueness, maybe the EDGE list? It is somewhat considered in the Red Listing but not enough.

2) What are the challenges, risks and feasibility?
    - In the last quarterly IUCN SSC news, the editorial called 'unmeasurable distance between late and too late' is valid. So, if there is a risk, we must do it because it is impossible to know when it's 'too late'. There was a disagreement because sometimes CR still have large populations, e.g. Bornean orangutan and Javan slow loris.
    - If wild capture of specimens are not considered harmful to the wild population, as based on careful consideration, appropriate planning and approval of such captures, it seems reasonable to move ahead and do it for ASAP listed species. Is the implication that if the opposite is true that we automatically then shouldn't do it? No, not necessarily. However, if species most at risk of extinction in the wild are prioritized, there is a risk that potentially easier and more successful opportunities for *ex situ* conservation measures might be decreased or lost. Examples from India: pygmy hog took only 6 individuals from wild, 20 years of successful captive breeding and releases.
    - There is an opportunity through rescues and captures to start with the species that are already appearing.

3) What are the processes and steps needed to do so?
    - Having a clear process and a clear goal – let's look at successes and failures.
    - Do a conservation action plan and do a quick assessment of the conservation needs. Bring *ex situ* needs into those conversations even if it's difficult. Don't let that be left out of those conversations and only focus on *in situ*.
    - Securing the *ex situ* collaboration organized to receive before the species are extracted.
    - Transboundary difficulties where each range area wants to have its own captive breeding program. Need to get that integration and collaboration in place, otherwise populations will be too small or not viable.
    - Have the facility identified that has the knowledge and will put the money in and handle the logistics. It is already covered in planning for single species but not for multi–species assessments.

- A second opinion about the importance of the *ex situ* side being really prepared and engaging with the *in situ* partners in order to get agreement. In Japan, the *in situ* community seems to have the final say, and their opinion is often considered more important.
- Have the right survey data or evidence base in place. Taking saola as an example, using the evidence base was how the Laos and Vietnamese governments got on board.

4) How do we best seek agreement with relevant stakeholders?
    - Get all people together and have an open debate and discussions.
    - Having IUCN Specialist Groups involvement is important either at contributing stakeholders or alternatively through providing data and information (if needed through surveys).
    - Stakeholders that are exception and who disagree with the majority should take more responsibility to ensure prevention of extinction of species.
    - There might be government fatigue for this approach if we do it species by species. Would it be best to approach with a list for the whole country at once? This might work in some countries but not others. Using the example or Sumatran orangutans and saola where it took years to get government buy-in. But is that because they are iconic controversial species?

Similarly, for ASAP species that do currently exist in captivity:

5) What criteria should be used to decide whether they are a priority for *ex situ* conservation management?

    The criteria that were discussed and found to be relevant were:
    - Number of individuals of each species currently in captivity; population health; degree of inbreeding.
    - Prior husbandry knowledge and captive experience for the species or similar species.
    - Existing research knowledge on captive breeding, prior breeding success, ecological information as well as reproductive biology and behaviours from *in situ* work.
    - Management team for the species exists (Sumatran rhino, orangutan) - evaluate and connect, species champions, population management groups, IUCN taxon-based specialist group.
    - Existing efforts to mitigate threats in the wild that are currently successful (can deprioritize the *ex situ* need then).
    - Political climate for species conservation action implementation can help prioritize or ignore.
    - Clear definition of *ex situ* actions as per the One Plan approach for the species. Clear links between *in situ* and *ex situ*.
    - Other stakeholders that are involved in species management? Aquaculture, pets?
    - Local community / government / stakeholder buy-in for *ex situ* program to be successful. Can help prioritize among multiple species. Market drivers for *ex situ* success could influence this – captive breeding for sale? Risk to be considered.
    - Existence of plans to manage the operations of the *ex situ* action.
    - Resources needed: finance, space, manpower.
    - Shorter generation time could help get more impact quickly; depends if the species is ready for release (all criteria in field are suitable). Balance between suitability of release sites – community engagement, habitat ready?
    - Species decline rates.
    - Prior success in release. Ease of monitoring post release.
    - Facilities/resources that are available for a keystone species that can also benefit a secondary species.
    - Existing government plans and strategies based on range states and process followed.

- Potential for *ex situ* facility to operate in the range country – beneficial.
- Criteria for being listed as CR (Red List)
- Charisma of the species (spark interest, funding, taxonomic uniqueness, etc.).

In conclusion to all discussions, participants were asked to prioritize an ASAP species for which *ex situ* effort can be initiated and that they personally can contribute to. The table below lists the species that were identified during the workshop.

No.	Taxon	Species	Name
1	Amphibian	*Leptophryne cruentata*	Bleeding toad/ fire toad
2	Reptile	*Batagur affinis*	Southern river terrapin
3	Reptile	*Batagur borneoensis*	Painted terrapin
4	Reptile	*Geochelone platynota*	Burmese starred tortoise
5	Bird	*Gallicolumba keayi*	Negros bleeding-heart dove
6	Bird	*Gyps tenuirostris*	Slender-billed vulture
7	Bird	*Houbaropsis bengalensis*	Bengal florican
8	Bird	*Pseudibis davisoni*	White-shouldered ibis
9	Bird	*Sarcogyps calvus*	Red-headed vulture
10	Bird	*Thaumatibis gigantea*	Giant ibis
11	Mammal	*Axis kuhlii*	Bawean deer
12	Mammal	*Dicerorhinus sumatrensis*	Sumatran rhinoceros
13	Mammal	*Lutra sumatrana*	Hairy-nosed otter
14	Mammal	*Macaca nigra*	Celebes crested macaque
15	Mammal	*Manis javanica*	Sunda pangolin
16	Mammal	*Manis pentadactyla*	Chinese pangolin
17	Mammal	*Nycticebus javanicus*	Javan slow loris
18	Mammal	*Panthera pardus melas*	Javan leopard
19	Mammal	*Pongo pygmaeus*	Bornean orangutan
20	Mammal	*Pseudoryx nghetinhensis*	Saola
21	Mammal	*Rhinoceros sondaicus*	Javan rhinoceros

Apart from ASAP species, if there are certain species that meet the selection criteria but have not yet been assessed as CR, and for which a One Plan approach conservation plan identifies *ex situ* needs for their conservation, the ESWG shall discuss what role to play in such cases.

APPENDIX 1: List of ASAP species and categorization based on animals in captivity.

1. None believed to be currently managed in captivity			
1	Amphibian	*Megophrys damrei*	-
2	Amphibian	*Pelophryne linanitensis*	-
3	Amphibian	*Pelophryne murudensis*	-
4	Amphibian	*Leptophryne cruentata*	Bleeding toad/ fire toad
5	Amphibian	*Leptolalax botsfordi*	Botsford's leaf-litter frog
6	Amphibian	*Platymantis insulatus*	Gigante Island frog
7	Amphibian	*Philautus jacobsoni*	Jackson's bubble-nest frog
8	Amphibian	*Ansonia guibei*	Mesilau stream toad
9	Amphibian	*Leptobrachella palmata*	Palm Borneo frog
10	Amphibian	*Oreolalax sterlingae*	Sterling's toothed toad
11	Amphibian	*Duttaphrynus sumatranus*	Sumatra toad
12	Bird	*Corvus unicolor*	Banggai crow
13	Bird	*Houbaropsis bengalensis*	Bengal florican
14	Bird	*Monarcha boanensis*	Black-chinned monarch
15	Bird	*Centropus steerii*	Black-hooded coucal
16	Bird	*Charmosyna toxopei*	Blue-fronted lorikeet
17	Bird	*Dicaeum quadricolor*	Cebu flowerpecker
18	Bird	*Eutrichomyias rowleyi*	Cerulean paradise-flycatcher
19	Bird	*Thalasseus bernsteini*	Chinese crested tern
20	Bird	*Fregata andrewsi*	Christmas frigatebird / Andrews' frigatebird
21	Bird	*Acridotheres tricolor*	Grey-backed myna
22	Bird	*Acridotheres tertius*	Grey-rumped myna
23	Bird	*Oriolus isabellae*	Isabela oriole
24	Bird	*Alcedo euryzona*	Javan blue-banded kingfisher
25	Bird	*Vanellus macropterus*	Javan lapwing
26	Bird	*Gracupica jalla*	Javan pied starling/ Javan Ppied myna
27	Bird	*Gallicolumba platenae*	Mindoro bleeding-heart
28	Bird	*Ptilinopus arcanus*	Negros fruit dove
29	Bird	*Gracula robusta*	Nias hill myna
30	Bird	*Rhodonessa caryophyllacea*	Pink-headed duck
31	Bird	*Cyornis ruckii*	Rueck's blue-flycatcher
32	Bird	*Ceyx sangirensis*	Sangihe dwarf kingfisher
33	Bird	*Thapsinillas platenae*	Sangihe golden bulbul
34	Bird	*Colluricincla sanghirensis*	Sangihe shrike-thrush
35	Bird	*Zosterops nehrkorni*	Sangihe white-eye
36	Bird	*Otus siaoensis*	Siau scops-owl
37	Bird	*Columba argentina*	Silvery pigeon/ grey wood-pigeon
38	Bird	*Gallicolumba menagei*	Sulu bleeding-heart
39	Bird	*Anthracoceros montani*	Sulu hornbill

40	Bird	*Prioniturus verticalis*	Sulu/blue-winged racquet-tail
41	Bird	*Carpococcyx viridis*	Sumatran ground cuckoo
42	Bird	*Ardea insignis*	White-bellied heron/ Imperial heron
43	Bird	*Eurochelidon sirintarae*	White-eyed river martin
44	Bird	*Emberiza aureola*	Yellow-breasted bunting
45	Fish	*Betta persephone*	-
46	Fish	*Betta spilotogena*	-
47	Fish	*Encheloclarias kelioides*	-
48	Fish	*Oreoglanis lepturus*	-
49	Fish	*Scaphognathops theunensis*	-
50	Fish	*Schistura leukensis*	-
51	Fish	*Schistura nasifilis*	-
52	Fish	*Schistura spiloptera*	-
53	Fish	*Schistura tenura*	-
54	Fish	*Sewellia albisuera*	-
55	Fish	*Puntius herrei*	Also known as *Barbodes herrei*
56	Fish	*Cephalakompsus pachycheilus*	Also known as *Barbodes pachycheilus*
57	Fish	*Puntius compressiformis*	Also known as *Systomus compressiformis*
58	Fish	*Puntius clemensi*	Bagangan; also known as *Barbodes clemensi*
59	Fish	*Mandibularca resinus*	Bagangan; also known as *Barbodes truncatulus*
60	Fish	*Puntius baoulan*	Baolan; also known as *Barbodes baoulan*
61	Fish	*Ospatulus truncatus*	Bitungu
62	Fish	*Encheloclarias curtisoma*	Bladefin catfish
63	Fish	*Nemacheilus troglocataractus*	Blind cave loach
64	Fish	*Sewellia breviventralis*	Butterfly loach
65	Fish	*Ceratoglanis pachynema*	Club-barbel sheatfish
66	Fish	*Puntius disa*	Disa; also known as *Barbodes disa*
67	Fish	*Adrianichthys kruyti*	Duck-billed buntingi
68	Fish	*Pandaka pygmaea*	Dwarf pygmy goby
69	Fish	*Glyphis siamensis*	Irrawaddy river shark
70	Fish	*Puntius flavifuscus*	Katapa-tapa; also known as *Barbodes flavifuscus*
71	Fish	*Puntius katalo*	Katolo; also known as *Barbodes katalo*
72	Fish	*Betta simplex*	Krabi mouth brooding betta
73	Fish	*Pristis pristis*	Largetooth sawfish
74	Fish	*Puntius manalak*	Manalak; also known as *Barbodes manalak*
75	Fish	*Hampala lopezi*	Manumbok; also known as Hampala
76	Fish	*Aaptosyax grypus*	Mekong giant salmon carp
77	Fish	*Puntius amarus*	Pait; also known as *Barbodes amarus*
78	Fish	*Spratellicypris palata*	Palata; also known as *Barbodes palata*
79	Fish	*Xenopoecilus poptae*	Popta's buntingi
80	Fish	*Weberogobius amadi*	Poso bungu

81	Fish	*Betta miniopinna*	Red fin betta
82	Fish	*Chilatherina sentaniensis*	Sentani rainbowfish
83	Fish	*Balantiocheilos ambusticauda*	Siamese bala-shark
84	Fish	*Datnioides pulcher*	Siamese tiger perch
85	Fish	*Puntius tras*	Tras; also known as *Barbodes tras*
86	Mammal	*Uromys boeadii*	Biak giant rat
87	Mammal	*Spilocuscus rufoniger*	Black-spotted cuscus
88	Mammal	*Spilocuscus wilsoni*	Blue-eyed spotted cuscus
89	Mammal	*Nomascus nasutus*	Cao-vit crested gibbon
90	Mammal	*Crateromys australis*	Dinagat bushy-tailed cloud rat
91	Mammal	*Uromys emmae*	Emma's giant rat
92	Mammal	*Dendrolagus pulcherrimus*	Golden-mantled tree kangaroo
93	Mammal	*Pygathrix cinerea*	Grey-shanked douc langur
94	Mammal	*Rhinoceros sondaicus*	Javan rhinoceros
95	Mammal	*Bos sauveli*	Kouprey
96	Mammal	*Bunomys coelestis*	Lampobatang bunomys
97	Mammal	*Muntiacus vuquangensis*	Large-antlered muntjac/ giant muntjac
98	Mammal	*Melomys fraterculus*	Manusela mosaic-tailed rat
99	Mammal	*Rhinopithecus strykeri*	Myanmar snub-nosed monkey
100	Mammal	*Macaca pagensis*	Pagai Island macaque
101	Mammal	*Dobsonia chapmani*	Philippine bare-backed fruit bat
102	Mammal	*Simias concolor*	Pig-tailed langur/ pig-tailed snub-nosed monkey
103	Mammal	*Presbytis chrysomelas*	Sarawak surili/ Bornean banded langur
104	Mammal	*Tarsius tumpara*	Siau Island tarsier
105	Mammal	*Zaglossus attenboroughi*	Sir David's long-beaked echidna
106	Mammal	*Bubalus mindorensis*	Tamaraw
107	Mammal	*Pongo tapanuliensis*	Tapanuli orangutan
108	Mammal	*Rhinopithecus avunculus*	Tonkin snub-nosed monkey
109	Mammal	*Zaglossus bruijnii*	Western long-beaked echidna
110	Mammal	*Trachypithecus poliocephalus*	Cat Ba langur; golden-headed langur
111	Mammal	*Dendrolagus mayri*	Wondiwoi tree-kangaroo
112	Reptile	*Calamaria ingeri*	-
113	Reptile	*Oligodon booliati*	Boo-Liat's kukri snake
114	Reptile	*Brachymeles cebuensis*	Cebu small worm skink
115	Reptile	*Calamaria prakkei*	Prakke's reed snake
116	Reptile	*Gongylosoma mukutense*	Pulau Tioman ground snake
117	Reptile	*Lycodon chrysoprateros*	Ross's wolf snake

2. Currently managed in captivity, but unclear on conservation programs			
1	Bird	*Phapitreron fontalis*	Cebu brown dove
2	Bird	*Nisaetus floris*	Flores hawk-eagle
3	Bird	*Thaumatibis gigantea*	Giant ibis
4	Bird	*Rhinoplax vigil*	Helmeted hornbill
5	Bird	*Sarcogyps calvus*	Red-headed vulture
6	Bird	*Rhabdotorrhinus waldeni*	Rufous-headed hornbill
7	Bird	*Pseudibis davisoni*	White-shouldered ibis
8	Mammal	*Pteropus aruensis*	Aru flying fox
9	Mammal	*Axis kuhlii*	Bawean deer
10	Mammal	*Nomascus concolor*	Black-crested gibbon
11	Mammal	*Trachypithecus delacouri*	Delacour's langur
12	Mammal	*Nycticebus javanicus*	Javan slow loris
13	Mammal	*Pseudoryx nghetinhensis*	Saola
14	Mammal	*Ailurops melanotis*	Talaud bear cuscus
15	Reptile	*Batagur baska*	Northern river terrapin
16	Reptile	*Batagur borneoensis*	Painted terrapin
17	Reptile	*Batagur affinis*	Southern river terrapin
18	Reptile	*Cuora picturata*	Southern Vietnam box turtle
19	Reptile	*Leucocephalon yuwonoi*	Sulawesi forest turtle
20	Reptile	*Mauremys annamensis*	Vietnamese pond turtle
21	Fish	*Catlocarpio siamensis*	Giant carp
22	Fish	*Pangasius sanitwongsei*	Giant pangasius
23	Fish	*Pristis zijsron*	Green sawfish
24	Fish	*Puntius lanaoensis*	Kandar, also known as *Barbodes lanaoensis*
25	Fish	*Pangasianodon gigas*	Mekong giant catfish
26	Fish	*Epalzeorhynchos bicolor*	Redtail sharkminnow
27	Fish	*Trigonostigma somphongsi*	Somphong's rasbora

3. Currently managed in captivity, well integrated into conservation programs			
1	Bird	*Aythya baeri*	Baer's pochard
2	Bird	*Leucopsar rothschildi*	Bali mynah
3	Bird	*Acridotheres melanopterus*	Black-winged mynah
4	Bird	*Lophura edwardsi*	Edward's pheasant
5	Bird	*Cissa thalassina*	Javan green magpie
6	Bird	*Gallicolumba keayi*	Negros bleeding-heart
7	Bird	*Cacatua haematuropygia*	Philippine cockatoo
8	Bird	*Pithecophaga jefferyi*	Philippine eagle
9	Bird	*Garrulax rufifrons*	Rufous-fronted laughingthrush
10	Bird	*Gyps tenuirostris*	Slender-billed vulture
11	Bird	*Calidris pygmaea*	Spoon-billed sandpiper

12	Bird	*Gyps bengalensis*	White-rumped vulture
13	Bird	*Cacatua sulphurea*	Yellow-crested cockatoo
14	Mammal	*Pongo pygmaeus*	Bornean orangutan
15	Mammal	*Macaca nigra*	Celebes crested macaque
16	Mammal	*Manis pentadactyla*	Chinese pangolin
17	Mammal	*Nomascus leucogenys*	Northern white-cheeked gibbon
18	Mammal	*Pongo albelii*	Sumatran orangutan
19	Mammal	*Dicerorhinus sumatrensis*	Sumatran rhinoceros
20	Mammal	*Manis javanica*	Sunda pangolin
21	Mammal	*Sus cebifrons*	Visayan warty pig
22	Reptile	*Heosemys depressa*	Arakan forest turtle
23	Reptile	*Chitra chitra*	Asian narrow-headed softshell turtle
24	Reptile	*Cuora bourreti*	Bourret's box turtle
25	Reptile	*Geochelone platynota*	Burmese starred tortoise
26	Reptile	*Cuora trifasciata*	Chinese three-striped box turtle
27	Reptile	*Cuora galbinifrons*	Indochinese box turtle
28	Reptile	*Siebenrockiella leytensis*	Palawan forest turtle
29	Reptile	*Crocodylus mindorensis*	Philippine crocodile
30	Reptile	*Crocodylus siamensis*	Siamese crocodile
31	Reptile	*Rafetus swinhoei*	Yangtze giant softshell turtle

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3	Amphibian	*Pelophryne murudensis*	-
4	Amphibian	*Leptophryne cruentata*	Bleeding toad/ fire toad
5	Amphibian	*Leptolalax botsfordi*	Botsford's leaf-litter frog
6	Amphibian	*Platymantis insulatus*	Gigante Island frog
7	Amphibian	*Philautus jacobsoni*	Jackson's bubble-nest frog
8	Amphibian	*Ansonia guibei*	Mesilau stream toad
9	Amphibian	*Leptobrachella palmata*	Palm Borneo frog
10	Amphibian	*Oreolalax sterlingae*	Sterling's toothed toad
11	Amphibian	*Duttaphrynus sumatranus*	Sumatra toad
12	Bird	*Corvus unicolor*	Banggai crow
13	Bird	*Houbaropsis bengalensis*	Bengal florican
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26	Bird	*Gracupica jalla*	Javan pied starling/ Javan Ppied myna
27	Bird	*Gallicolumba platenae*	Mindoro bleeding-heart
28	Bird	*Ptilinopus arcanus*	Negros fruit dove
29	Bird	*Gracula robusta*	Nias hill myna
30	Bird	*Rhodonessa caryophyllacea*	Pink-headed duck
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39	Bird	*Anthracoceros montani*	Sulu hornbill

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44	Bird	*Emberiza aureola*	Yellow-breasted bunting
45	Fish	*Betta persephone*	-
46	Fish	*Betta spilotogena*	-
47	Fish	*Encheloclarias kelioides*	-
48	Fish	*Oreoglanis lepturus*	-
49	Fish	*Scaphognathops theunensis*	-
50	Fish	*Schistura leukensis*	-
51	Fish	*Schistura nasifilis*	-
52	Fish	*Schistura spiloptera*	-
53	Fish	*Schistura tenura*	-
54	Fish	*Sewellia albisuera*	-
55	Fish	*Puntius herrei*	Also known as *Barbodes herrei*
56	Fish	*Cephalakompsus pachycheilus*	Also known as *Barbodes pachycheilus*
57	Fish	*Puntius compressiformis*	Also known as *Systomus compressiformis*
58	Fish	*Puntius clemensi*	Bagangan; also known as *Barbodes clemensi*
59	Fish	*Mandibularca resinus*	Bagangan; also known as *Barbodes truncatulus*
60	Fish	*Puntius baoulan*	Baolan; also known as *Barbodes baoulan*
61	Fish	*Ospatulus truncatus*	Bitungu
62	Fish	*Encheloclarias curtisoma*	Bladefin catfish
63	Fish	*Nemacheilus troglocataractus*	Blind cave loach
64	Fish	*Sewellia breviventralis*	Butterfly loach
65	Fish	*Ceratoglanis pachynema*	Club-barbel sheatfish
66	Fish	*Puntius disa*	Disa; also known as *Barbodes disa*
67	Fish	*Adrianichthys kruyti*	Duck-billed buntingi
68	Fish	*Pandaka pygmaea*	Dwarf pygmy goby
69	Fish	*Glyphis siamensis*	Irrawaddy river shark
70	Fish	*Puntius flavifuscus*	Katapa-tapa; also known as *Barbodes flavifuscus*
71	Fish	*Puntius katalo*	Katolo; also known as *Barbodes katalo*
72	Fish	*Betta simplex*	Krabi mouth brooding betta
73	Fish	*Pristis pristis*	Largetooth sawfish
74	Fish	*Puntius manalak*	Manalak; also known as *Barbodes manalak*
75	Fish	*Hampala lopezi*	Manumbok; also known as Hampala
76	Fish	*Aaptosyax grypus*	Mekong giant salmon carp
77	Fish	*Puntius amarus*	Pait; also known as *Barbodes amarus*
78	Fish	*Spratellicypris palata*	Palata; also known as *Barbodes palata*
79	Fish	*Xenopoecilus poptae*	Popta's buntingi

80	Fish	*Weberogobius amadi*	Poso bungu
81	Fish	*Betta miniopinna*	Red fin betta
82	Fish	*Chilatherina sentaniensis*	Sentani rainbowfish
83	Fish	*Balantiocheilos ambusticauda*	Siamese bala-shark
84	Fish	*Datnioides pulcher*	Siamese tiger perch
85	Fish	*Puntius tras*	Tras; also known as *Barbodes tras*
86	Mammal	*Uromys boeadii*	Biak giant rat
87	Mammal	*Spilocuscus rufoniger*	Black-spotted cuscus
88	Mammal	*Spilocuscus wilsoni*	Blue-eyed spotted cuscus
89	Mammal	*Nomascus nasutus*	Cao-vit crested gibbon
90	Mammal	*Crateromys australis*	Dinagat bushy-tailed cloud rat
91	Mammal	*Uromys emmae*	Emma's giant rat
92	Mammal	*Dendrolagus pulcherrimus*	Golden-mantled tree kangaroo
93	Mammal	*Pygathrix cinerea*	Grey-shanked douc langur
94	Mammal	*Rhinoceros sondaicus*	Javan rhinoceros
95	Mammal	*Bos sauveli*	Kouprey
96	Mammal	*Bunomys coelestis*	Lampobatang bunomys
97	Mammal	*Muntiacus vuquangensis*	Large-antlered muntjac/ giant muntjac
98	Mammal	*Melomys fraterculus*	Manusela mosaic-tailed rat
99	Mammal	*Rhinopithecus strykeri*	Myanmar snub-nosed monkey
100	Mammal	*Macaca pagensis*	Pagai Island macaque
101	Mammal	*Dobsonia chapmani*	Philippine bare-backed fruit bat
102	Mammal	*Simias concolor*	Pig-tailed langur/ pig-tailed snub-nosed monkey
103	Mammal	*Presbytis chrysomelas*	Sarawak surili/ Bornean banded langur
104	Mammal	*Tarsius tumpara*	Siau Island tarsier
105	Mammal	*Zaglossus attenboroughi*	Sir David's long-beaked echidna
106	Mammal	*Bubalus mindorensis*	Tamaraw
107	Mammal	*Pongo tapanuliensis*	Tapanuli orangutan
108	Mammal	*Rhinopithecus avunculus*	Tonkin snub-nosed monkey
109	Mammal	*Zaglossus bruijnii*	Western long-beaked echidna
110	Mammal	*Trachypithecus poliocephalus*	Cat Ba langur; golden-headed langur
111	Mammal	*Dendrolagus mayri*	Wondiwoi tree-kangaroo
112	Reptile	*Calamaria ingeri*	-
113	Reptile	*Oligodon booliati*	Boo-Liat's kukri snake
114	Reptile	*Brachymeles cebuensis*	Cebu small worm skink
115	Reptile	*Calamaria prakkei*	Prakke's reed snake
116	Reptile	*Gongylosoma mukutense*	Pulau Tioman ground snake
117	Reptile	*Lycodon chrysoprateros*	Ross's wolf snake

2. Currently managed in captivity, but unclear on conservation programs			
1	Bird	*Phapitreron fontalis*	Cebu brown dove
2	Bird	*Nisaetus floris*	Flores hawk-eagle
3	Bird	*Thaumatibis gigantea*	Giant ibis
4	Bird	*Rhinoplax vigil*	Helmeted hornbill
5	Bird	*Sarcogyps calvus*	Red-headed vulture
6	Bird	*Rhabdotorrhinus waldeni*	Rufous-headed hornbill
7	Bird	*Pseudibis davisoni*	White-shouldered ibis
8	Mammal	*Pteropus aruensis*	Aru flying fox
9	Mammal	*Axis kuhlii*	Bawean deer
10	Mammal	*Nomascus concolor*	Black-crested gibbon
11	Mammal	*Trachypithecus delacouri*	Delacour's langur
12	Mammal	*Nycticebus javanicus*	Javan slow loris
13	Mammal	*Pseudoryx nghetinhensis*	Saola
14	Mammal	*Ailurops melanotis*	Talaud bear cuscus
15	Reptile	*Batagur baska*	Northern river terrapin
16	Reptile	*Batagur borneoensis*	Painted terrapin
17	Reptile	*Batagur affinis*	Southern river terrapin
18	Reptile	*Cuora picturata*	Southern Vietnam box turtle
19	Reptile	*Leucocephalon yuwonoi*	Sulawesi forest turtle
20	Reptile	*Mauremys annamensis*	Vietnamese pond turtle
21	Fish	*Catlocarpio siamensis*	Giant carp
22	Fish	*Pangasius sanitwongsei*	Giant pangasius
23	Fish	*Pristis zijsron*	Green sawfish
24	Fish	*Puntius lanaoensis*	Kandar, also known as *Barbodes lanaoensis*
25	Fish	*Pangasianodon gigas*	Mekong giant catfish
26	Fish	*Epalzeorhynchos bicolor*	Redtail sharkminnow
27	Fish	*Trigonostigma somphongsi*	Somphong's rasbora

3. Currently managed in captivity, well integrated into conservation programs			
1	Bird	*Aythya baeri*	Baer's pochard
2	Bird	*Leucopsar rothschildi*	Bali mynah
3	Bird	*Acridotheres melanopterus*	Black-winged mynah
4	Bird	*Lophura edwardsi*	Edward's pheasant
5	Bird	*Cissa thalassina*	Javan green magpie
6	Bird	*Gallicolumba keayi*	Negros bleeding-heart
7	Bird	*Cacatua haematuropygia*	Philippine cockatoo
8	Bird	*Pithecophaga jefferyi*	Philippine eagle
9	Bird	*Garrulax rufifrons*	Rufous-fronted laughingthrush
10	Bird	*Gyps tenuirostris*	Slender-billed vulture
11	Bird	*Calidris pygmaea*	Spoon-billed sandpiper

12	Bird	*Gyps bengalensis*	White-rumped vulture
13	Bird	*Cacatua sulphurea*	Yellow-crested cockatoo
14	Mammal	*Pongo pygmaeus*	Bornean orangutan
15	Mammal	*Macaca nigra*	Celebes crested macaque
16	Mammal	*Manis pentadactyla*	Chinese pangolin
17	Mammal	*Nomascus leucogenys*	Northern white-cheeked gibbon
18	Mammal	*Pongo albelii*	Sumatran orangutan
19	Mammal	*Dicerorhinus sumatrensis*	Sumatran rhinoceros
20	Mammal	*Manis javanica*	Sunda pangolin
21	Mammal	*Sus cebifrons*	Visayan warty pig
22	Reptile	*Heosemys depressa*	Arakan forest turtle
23	Reptile	*Chitra chitra*	Asian narrow-headed softshell turtle
24	Reptile	*Cuora bourreti*	Bourret's box turtle
25	Reptile	*Geochelone platynota*	Burmese starred tortoise
26	Reptile	*Cuora trifasciata*	Chinese three-striped box turtle
27	Reptile	*Cuora galbinifrons*	Indochinese box turtle
28	Reptile	*Siebenrockiella leytensis*	Palawan forest turtle
29	Reptile	*Crocodylus mindorensis*	Philippine crocodile
30	Reptile	*Crocodylus siamensis*	Siamese crocodile
31	Reptile	*Rafetus swinhoei*	Yangtze giant softshell turtle

APPENDIX 2: Challenges, risks and opportunities of proactive approaches to *ex situ* management of ASAP species

A. For ASAP species that are not yet managed in captivity

Challenges and risks

Policy and Legislation

- Do international conventions stand in the way of capture/export of species and, if so, what are the processes to address this?
- Does range country legislation stand in the way of capture and export of species? If so, which government agencies is in charge and what is the process?
- Must be aligned and follow the existing country-specific management strategies and programs.

Operational

- Need for local facilities to keep and breed species and facilitate capture and export. Range countries have valid claim but maybe not have the best facilities.
- Capture not easy
- Adaptation to captivity
- Can we get enough individuals to work towards sustainable *ex situ* populations? Are sufficient genetic founders available for the *ex situ* populations? If very low numbers in the wild, it might cause too small numbers if breeding pairs are taken out.
- Not enough information on wild population sizes to decide when is the right time. Ecological needs/breeding not understood. What triggers a last minute intervention?
- How to keep animals alive/manage in captivity? Need for husbandry knowledge. Unknown husbandry and reproductive needs for many of the species.
- Need for appropriate funding. There are already limited resources to manage current *ex situ* programs. Could negatively impact current programs.
- Need DRA (disease risk assessment)
- Risk for reputation
- Risk of death (or injury) during the capture and transport processes and the consequences for continuing with the breeding program
- Balancing trigger point to start *ex situ* program- too early or too late?
- Taxonomy uncertainty, especially for amphibians, reptiles and fish
- If you collect species before they are Critically Endangered it may not be deemed necessary, yet, if it's done too late it may not be enough. How to strike the balance?

Stakeholders

- Need for IUCN/zoo community to accept that ASAP can mandate an *ex situ* program.
- One of main risks is failure of communications strategy (or lack of it) rather than biological failure- i.e. around the unavoidable but acceptable risk of *ex situ* management.
- Working with governments, risk associated with death and failure management
- Deciding who is in the best position to do it (location?)
- Accountability, both for poor management and for blame of failure
- Local opposition to removing the species
- Risk of failure -- loss of political will

Opportunities

- Evidence of decision for *ex situ* program based on sound science, expertise, reasoning and agreement among the *in situ* and *ex situ* species specialists
- Engagement with private collections/collectors in Southeast Asia
- To consider wild-caught animals from rescue centers or confiscations as potential founders for an *ex situ* population
- To ensure species survival, get knowledge on species, opportunities for research
- Need for insurance
- Collaborative approach to get more info
- Start small, low key
- Convince local decision makers
- Collection of eggs; risk reduction (i.e. turtles, birds)
- You can raise more awareness by starting an *ex situ* population.
- *Ex situ* activities may raise awareness and spark funding support.

B. Evaluating the "quality" of existing *ex situ* programs in regard to their connection /contribution to *in situ* conservation

Understanding the health of the population held*ex situ*:

- Breeding success in captivity to date
- Survival rate
- Genetic diversity
- Demographic and genetic sustainability
- Fitness for release
- Some species are not secured in captivity to be able to have stable captive populations.

Available husbandry expertise

- Is the husbandry and care management in place / understood
- Lack of information (high mortality rate)
- Are disease protocols and risks addressed

Mis-use of intent

- Animals (coming into) *ex situ* might be used for commercial purposes like farming

Population Management Program

- Is there a professionally managed program in place (in the region and/or globally)?
- Is the purpose of the breeding program understood by all relevant stakeholders?
- Are the *ex situ* programs able to collaborate across regions/countries?
- It is difficult to keep the facility members focused on 'why' the species is in captivity.
- Does the *ex situ* program have a clear "governing/ decision" structure?
- How to define "quality" of an existing program; requires work to create and evaluate existing programs.
- If the program is not successful, the species might/will disappear forever.

Record keeping

- Records are of crucial important:
    - To know where animals are and get information on the demographic and genetic makeup of the populations held *ex situ*
    - Currently there are few zoos in Southeast Asia that are Species360 members.
    - Data quality issues with the data that are in Species360
- Lack of information on which species are actually in captivity and how *ex situ*-held animals are linked to *in situ* conservation work.
- Challenge: A "bad" assessment may leave a species unaided at a time when more action was necessary.

Existing links to the field / One Plan approach

- Is there cooperation with *in situ* projects, colleagues?
- Field survey and monitoring for release
- Challenge: need to make all plans work to convince others that captivity is a viable solution
    - It assumes captivity is the solution for all and this may not be the case.
- Is there an overall conservation plan for the species?
- Are there clear roles for the *ex situ* activities in the overall conservation plan for the species?
    - Often the role of *ex situ* population is not clear even if the population is well managed (roles should follow the IUCN *ex situ* guidelines).
- Did *in situ* and *ex situ* specialists set the *ex situ* conservation roles together?
- Does the *ex situ* program have an action plan / activity plan?
- Are exit strategies in place?
- Clear agreements / understanding to move animals from where they are bred to where they are needed for *in situ* release (think Sumatran rhino)
- Often no link to *in situ* (even if well managed)

Resources/capacity

- Professional staff/ facilities (can be very simple, just need to be species- and *ex situ*-role specific).
- Sometimes there are breeding facilities, but these are poorly managed or even not managed.
- Lack of organization and mission fit within Southeast Asian zoos, sanctuaries, private holders
    - How to steer to support conservation