Partnerships for Conservation: It Takes a Village

By Lindsay Renick Mayer, The Nature Conservancy

It had all of the trappings of a devastating conservation tale: a population of the state-rare Eastern Tiger Salamander (Ambystoma tigrinum tigrinum) had plummeted after human disruption to critical breeding habitat in Maryland. The Maryland Department of Natural Resources couldn’t move quickly enough to purchase the property when it went on market. And while The Nature Conservancy’s Maryland/DC chapter could move fast, the private organization didn’t have the herpetological expertise to ensure population recovery.

It was only by working together that the DNR and The Nature Conservancy turned the story around. The Nature Conservancy purchased the land and held it for the state until the DNR could purchase it. Because the property was adjacent to state-owned property, the DNR had site-specific management expertise and removed invasive trees and herbaceous species from the wetland basin. That was nearly 20 years ago. Today the success of that partnership is evident. Last winter the DNR counted more tiger salamander egg masses than the state agency had surveyed since 1990.

The Nature Conservancy has a long history of partnering with both public and private organizations to most effectively protect animal and plant species, habitat, and even whole ecosystems. The Conservancy’s Maryland/DC and Virginia chapters have been protecting habitat in both the Chesapeake Bay and Appalachia, which is home to the most biodiverse community of salamanders in the world. Nearly 14 percent of the world’s

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The Newt that Crossed the Road

By Tariq Stark

What happens in spring when a small, fragile creature like a newt crosses the road to reach its breeding pond? You may have guessed it: this tiny amphibian does not mix well with cars, scooters, mopeds, or even bikes. Still, the newt has no choice other than to cross it if it is to participate in that year’s breeding season. In that annual effort, lots of

continued on p. 4
Get Your October Photo Contest Calendar - Free!

Is that really a salamander? Yes, it’s an Everglades Dwarf Siren (*Pseudobranchus axanthus belli*), found by this month’s winning photographer, Josh Young. Take a closer look and see our sticky but charming runner-up, go to http://www.parcplace.org/images/stories/YOSal/YoSalCalendarOctober.pdf.

Call for Photos for the 2014 Year of the Salamander Calendar Photo Contest

We are seeking close-up, digital photos of salamanders, preferably in their natural habitats or within an educational or conservation context. One winner will be selected each month to be the featured photo as part of the Year of the Salamander online calendar. Runner-up photos will also be included in the calendar. In addition, all submitted images will be considered for use in the Year of the Salamander monthly newsletter and website as well as other Year of the Salamander-related conservation, outreach, and educational efforts. Give us your best shot! For more information and for entry details, please visit http://www.parcplace.org/images/stories/YOSal/YOSphotocontest.pdf.

Get your Year of the Salamander 2014 Gear!

Ready to gear up for Year of the Salamander? We’ve got you covered!

At the Café Press PARCStore, you can find just about any style of t-shirt, sweatshirt, or hoodie, for men, women, or children. But don’t stop there - you’ll find a messenger bag, field bag, aluminum water bottle, even a beach towel (in case you want to join the salamanders crawling out of that primeval sea).

And take a look at the beautiful *Year of the Salamander Wall Calendar*, full of fantastic salamander photos for every month of your year!

Proceeds from sales go to the Year of the Salamander Conservation grant, managed by Amphibian and Reptile Conservancy, a not-for-profit organization that helps support PARC activities, such as public education, publications, and research.

September Newsletter Content Coordinator: Candace M. Hansen-Hendrikx, Amphibians.org
Design and layout: Kathryn Ronnenberg, U.S. Forest Service, Pacific Northwest Research Station
Salamander News Facilitator: Tom Gorman, Virginia Tech
Year of the Salamander Committee Chair: Mary Beth Kolozsvary, Siena College
Year of the Salamander Collaborating Partners

The Year of the Salamander Planning Team is pleased to welcome the following organizations to our growing list of collaborating partners:

The Nature Conservancy

The mission of The Nature Conservancy is to conserve the lands and waters on which all life depends. We achieve this mission through the dedicated efforts of our diverse staff, including more than 600 scientists, located in all 50 U.S. states and more than 35 countries; with the help of our many partners, from individuals and governments to local nonprofits and corporations; and by using a non-confrontational, collaborative approach and staying true to our five unique core values.

www.nature.org

Crawford Park District

The Crawford Park District, located in north-central Ohio, is focused on preservation through education. We seek to raise awareness and appreciation for the environment by offering programs to people of all ages. Education today....Preservation tomorrow.

www.crawfordparkdistrict.org

New Jersey Audubon

The New Jersey Audubon Society is a privately supported, not-for profit, statewide membership organization. Founded in 1897, and one of the oldest independent Audubon societies, New Jersey Audubon has no connection with the National Audubon Society. New Jersey Audubon fosters environmental awareness and a conservation ethic among New Jersey’s citizens; protects New Jersey’s birds, mammals, amphibians, reptiles, other animals, and plants, especially endangered and threatened species; and promotes preservation of New Jersey’s valuable natural habitats. New Jersey Audubon Education department has been coordinating Amphibian crossing with other partners since 2003 and New Jersey Audubon Stewardship Department performs and/or assists with large-scale habitat restorations on private and public lands for a variety of wildlife including enhancing and /or restoration vernal pool and other wetland/woodland habitats across NJ. Salamander species that benefit from these restorations include Spotted, Jefferson, Long-tailed, Marbled, Eastern Tiger, and Blue-spotted Salamander.

www.njaudubon.org

The Friends of the Cache River Watershed

The Friends of the Cache River Watershed is a non-profit citizens’ group that promotes natural resource conservation throughout the Cache River Watershed in southern Illinois. We work together with landowners and members of the Joint Venture Partnership, which includes Ducks Unlimited, Inc., Illinois Department of Natural Resources, Natural Resource Conservation Service, The Nature Conservancy and the U.S. Fish and Wildlife Service. Together we share a common goal to protect and restore 60,000 acres along a 50-mile corridor of the Cache River.

http://friendsofcache.org/

Nature Abounds

Nature Abounds is a national 501c3 non-profit organization that’s focus is bringing people together for the planet, specifically through environmental volunteerism and stewardship. Among Nature Abounds’ programs are IceWatch USA, Watch the Wild, the Senior Environment Corps, Turtle Ambassadors, Climate Change Ambassadors, and Knitters for Nature’s Critters.

www.natureabounds.org

Alaska Herpetological Society

The Alaska Herpetological Society is a nonprofit organization dedicated to advancing the field of Herpetology in the State of Alaska. Our mission is to promote sound research and management of amphibians and reptiles in the North, to foster responsible pet ownership and to provide opportunities in outreach, education, and citizen science for individuals who are interested in these species.

www.akherpsociety.org
We are still recruiting partners! If you are interested in contributing to the Year of the Salamander efforts, please send an email to yearofthesalamander@gmail.com with a brief description of your organization and its efforts. Our full list of partners can be found at http://www.parcplace.org/news-a-events/2014-year-of-the-salamander/68-uncategorised/281-year-of-the-salamander-partners.html

Reptile, Amphibian and Fish Conservation Netherlands (RAVON)
http://www.ravon.nl/En/tabid/376/Default.aspx

The aim of RAVON is to increase the number of sustainable populations of amphibians, reptiles and freshwater fish in the Netherlands. Our work is based on research and uses best conservation practices. As an independent NGO, we also influence regional and national policy to achieve this goal. We collaborate closely with universities and other NGOs and we are supported by more than 2,000 volunteers in collecting long-term population data.

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The Newt that Crossed the Road, cont. from p. 1

newts lose their lives or are severely injured by vehicles whose drivers do not notice them. Both Old- and New-world newts and salamanders face this challenge every year (sometimes even twice, when they migrate to their summer habitat, but usually with fewer casualties). The case for newts in the Netherlands, a country riddled with roads, is no different.

Since 2012, a small but dedicated group of conservationists have been helping four anuran species and one newt species to cross a busy bicycle path during their spring migration in a very urban environment the North of the Netherlands (Leeuwarden). The project was initiated in the spring of 2011, when two of the project founders, Carlijn Laurijssens and Tariq Stark, discovered up to 20 Common (Smooth) Newts (Lissotriton vulgaris) a night DOR on the path [DOR means ‘dead on road’]. The death of these newts kick-started this project.

To help the newts, frogs, and toads cross the road, a screen and pitfall traps are placed on both sides of the road. The screens function as an obstacle for the animals and guide them toward and into the pitfalls. These are emptied twice a day (in the morning and evening), and the animals are placed in the water, safe and sound. After the breeding season, we look for larvae from June until the end of August to check up on their breeding success.

Common Newts and Common Toads (Bufo bufo) make up the majority of the total number of individual amphibians captured every year. In the three years that the project has existed, a whopping total of 1015 newts have been safely transferred to their breeding waters! Plans are already in the making to continue our efforts in 2015.

People make the project. This project revolves around the people involved! Student volunteers, people from the neighbourhood,
salamander species live in Appalachia, which extends from southern New York, down to South Carolina and over to Mississippi [1]. [If reading this newsletter in hardcopy or offline, see p. 4 for links.]

In addition to helping the U.S. Forest Service acquire land in the 1970s around Mt. Rogers, which is home to several globally rare salamanders, The Nature Conservancy’s Virginia chapter has helped protect more than 35,000 acres of critical natural habitat in the Clinch Valley [2] in southwest Virginia.

The Eastern Hellbender (Cryptobranchus alleganiensis alleganiensis), North America’s largest salamander, lives in cooler creeks and streams in southwest Virginia. With partners such as the Virginia Dept. of Game and Inland Fisheries and the Virginia Department of Conservation and Recreation, The Nature Conservancy is managing Clinch River tributaries and land to ensure premium water quality for the hellbender and other species living downstream. Protected land in the Clinch is also providing important landscape connectivity for the high-elevation, rare Green Salamander (Aneides aeneus).

While The Nature Conservancy’s work with partners to protect habitat throughout the Appalachian region has been an important component of conserving salamanders, so, too, are partner efforts to promote these colorful little jewels. On Earth Day this year, The Nature Conservancy and The Smithsonian Conservation Biology Institute took a public radio reporter out to Finzel Swamp [3], a TNC-owned preserve and “frost pocket” in the Appalachian highlands of western Maryland.

The group spent the day catching salamanders—Eastern (Red-spotted) Newts (Notophthalmus viridescens), Spotted Salamanders (Ambystoma maculatum) and the majestic Long-tailed Salamander (Eurycea longicauda longicauda). While the SCBI scientist was able to talk about the specific species, The Nature Conservancy’s conservation ecologist could talk about the quality of habitat for amphibians. It was a terrific partnership that told a full story, resulting in a blog post [4] and colorful radio spot [5].

Over the next 100 years, Appalachia is expected to see an overall temperature increase between 3 and 11 degrees Fahrenheit as the result of climate change, which is bad news for animals that live in cold, fast-flowing water. The Nature Conservancy will continue working with key partners to identify and protect key components of landscapes to make them more resilient in the face of climate change.

Links:

The Nature Conservancy and the Smithsonian Conservation Biology Institute took a public radio reporter out to the Conservancy’s Finzel Swamp Preserve to find salamanders, including the long-tailed salamander. Photo by Lauren Ludi, The Nature Conservancy.
Conservation Partnerships on the Coast of Ecuador

By Ryan L. Lynch

While it is true that the Amazon is experiencing some of the world’s most severe deforestation, it has gone relatively unnoticed that the coast of Ecuador has one of the highest rates of deforestation in South America. The coast of Ecuador is frequently recognized as one of the areas most at risk of biological extinction on the planet due to a massive loss of forest cover (Fig. 1; Dodson & Gentry 1991). It is currently estimated that only 2-4% of native forest cover still remains along the coast of Ecuador (Dodson & Gentry 1991). The importance of immediate action and conservation partnerships along the coast of Ecuador cannot be overstated. High levels of species diversity combined with low levels of existing protection make the central coast of Ecuador one of the most critical conservation priorities in the country (Lessmann et al. 2014).

In the central coastal province of Manabi a network of conservation organizations are joining forces to protect some of the last remnants of Pacific Equatorial Forest in the Tumbes-Chocó-Magdalena Biodiversity Hotspot. This partnership, made up of Third Millennium Alliance, The Biodiversity Group, and Ceiba Foundation for Tropical Conservation, are working together to protect the threatened forests of coastal Ecuador, to reforest what has already...
been lost, and to collect important biological data that supports their conservation missions. At the center of their conservation efforts are two protected reserves: Bosque Seco Lalo Loor and Jama-Coaque Ecological Reserve. Together the two neighboring reserves protect roughly 1,515 acres of tropical dry forest, semi-deciduous forest, tropical moist forest, and pre-montane cloud forest (Fig. 2).

Population surveys of the amphibians and reptiles of Bosque Seco Lalo Loor and Jama-Coaque Ecological Reserve have been ongoing since 2009. To date 28 species of amphibian and 43 species of reptile have been documented between the two reserves. Of the 71 species recorded between the two reserves, one of the most special discoveries due to their rarity has been the observation of numerous *Bolitoglossa* salamanders. *Bolitoglossa* salamanders are a unique and understudied neotropical genus that are infrequently found in the coastal forests of Ecuador. Individuals found in the Jama-Coaque Reserve have been identified as *B. chica*, aptly named for its small body size relative to other species in the genus, and a second larger species that has yet to be identified with 100% certainty (Fig. 3). The observation of *Bolitoglossa* salamanders in these forests is just one of many reasons why it is important that local organizations continue to work together to protect the coastal forests of Ecuador before they are gone forever.

A free full-color PDF field guide to the amphibians of the Jama-Coaque Reserve is available for download at: Amphibians.org.

**Literature:**
Competition for Habitat

The Appalachian Region is the global epicenter of salamander diversity. The Appalachian Mountains contain 76 salamander species representing more than a dozen genera, with nearly half of those species endemic to the area. The status of these salamanders remains relatively uncertain due to a multitude of environmental threats, in addition to the difficulties in sampling individuals and estimating populations.

A collaborative effort by the USGS and the Smithsonian Conservation Biology Institute are addressing some of these uncertainties by focusing research on two species of Plethodontid salamanders, the Eastern Red-backed Salamander (*Plethodon cinereus*) and the Shenandoah Salamander (*Plethodon shenandoah*). The Shenandoah Salamander is a federally endangered species found only within the boundaries of Shenandoah National Park, Virginia. This terrestrial salamander is isolated to approximately 6 km² of dry talus slopes at high elevations in the park (above 800 m). Results of previous research suggest that *Plethodon shenandoah* is competitively excluded to suboptimal talus habitats by the Eastern Red-backed Salamander, and have implicated competition as the dominant driver of extinction risk for this species. However, recent occupancy analysis suggests that climate change appears to be the dominant driver of extinction risk for *P. shenandoah*, and that the risk may be further exacerbated when climate change interacts with competition.

Climate change models predict a warming (2-6°C), an increase in the severity of rain events and prolonged drought, and importantly, more variable temperatures throughout Appalachia over the next century. The Smithsonian and USGS came together to look at how the effects of temperature and humidity influence both the potential to limit distributions of one or both species, and change the nature of the interaction between the species. The research design investigates these relationships by using innovative three-dimensional microcosms to examine growth and behavior differences in response to climate and competition treatments (Fig. 1). We designed this experiment to directly test *P. shenandoah*’s response to competition under realistic climate conditions.

In order to focus on the effect of competition together with climate, we designed a unique experimental chamber with habitat and climate conditions that mimic reality by: (1) developing a 3-dimensional space that looks and feels like the high-elevation talus habitats; and (2) creating realistic environmental conditions in the chambers. We constructed 60 of these chambers to house 2 adult male salamanders in each, paired for intra- and interspecific competition treatments (Fig. 2,3,4). We are looking at two response variables: (1) behavior in terms of surface frequency; and (2) fitness as measured by body condition. Surface frequency has implications for effective monitoring in that it will provide information on how competition under climate change affects surface detection probability. Body condition allows us to measure the impact of climate and competition stressors on the experimental salamanders. The *P. shenandoah* study results are currently under analysis, but preliminarily our behavioral observations and body condition scale do show that *P. shenandoah* is not out-competed by *P. cinereus* under various environmental treatments within our microcosm design.

Fig. 1. Cross-sectional view of the microcosm design, this design allows for optimal observation of natural behaviors including competition.

Fig. 2. One of many metal shelving units holding over a dozen microcosms.

Fig. 3. Eric and crew conducting observations.

Fig. 4. Microcosm with Eastern Red-backed Salamander.

By Matthew Evans—Smithsonian Conservation Biology Institute, National Zoological Park, and Eric Dallalio—US Geological Survey, North East Amphibian Monitoring and Research Initiative
Evidence-based Salamander Conservation

By Helen Meredith, PhD candidate, Durrell Institute of Conservation and Ecology, University of Kent, Institute of Zoology, Zoological Society of London, Amphibian Specialist Group Programme Officer

An important resource for conservation decision-makers was published this year – “Amphibian Conservation: Evidence for the Effects of Interventions” (Smith & Sutherland 2014). Also known as the Amphibian Synopsis, it collates and summarises scientific knowledge about what works and does not work in amphibian conservation. Currently, it comprises evidence from over 400 publications across a comprehensive list of 129 conservation actions, compiled by an expert advisory board. It is freely available as a searchable database or as a pdf to download, and can also be purchased as a book, all through: www.ConservationEvidence.com

“Conservation evidence” describes any study that quantitatively tests the effect of an intervention used by conservation practitioners to protect species. The use of evidence to support conservation decision-making can alert practitioners to better methods and highlight interventions that are ineffective (Sutherland et al. 2004). A concerted move towards the practice of evidence-based conservation has huge potential to improve results and generate more successful outcomes in the management of species and habitats.

The Amphibian Synopsis features 220 amphibian species from 36 countries. However, in honour of the Year of the Salamander, we shall put frogs, toads, and caecilians to one side for now and focus on what the Amphibian Synopsis can tell us about caudate conservation. Fifty-nine species of salamander from 16 countries are included to date, and although salamanders only account for around 9% of extant amphibians, they represent 27% of the species listed in the synopsis. Relevant conservation interventions span a wide variety of actions from habitat and species management, to the removal of invasive species and awareness-raising activities. Certain key interventions feature evidence summarised solely for the purpose of salamander conservation, including pond creation, translocation, and captive breeding. The majority of evidence so far accumulated focuses on interventions that support habitat conservation and restoration. Given that over 95% of salamander species listed by the IUCN are threatened by the loss, degradation, and fragmentation of their habitat, it is perhaps reassuring that these interventions take precedence.

Although a body of evidence clearly exists that can help inform conservation decision-making, a great deal more is required. Only around 10% of all salamander species currently appear in the synopsis, and over half of all evidence records refer to just five species—in descending order: Great Crested Newt (Triturus cristatus); Spotted Salamander (Ambystoma maculatum); Smooth Newt (Lissotriton vulgaris); Eastern Red-backed Salamander (Plethodon cinereus); and Mountain Dusky Salamander (Desmognathus ochrophaeus). Only one of the 16 range countries mentioned is in the tropics (Mexico), and 80% of species so far included in the synopsis are listed as not threatened (Least Concern or Near Threatened) by the IUCN Red List of Threatened Species (www.iucnredlist.org), whereas nearly half of all salamander species are listed as threatened globally. Perils such as invasive species, disease, climate change, exploitation, and pollution are heavily under-represented by available evidence supporting the use of interventions to mitigate these threats.

The salamanders therefore need your help! The synopsis is currently undergoing a rigorous assessment, which will place all interventions into effectiveness categories based expert appraisal of the existing evidence. The results will be
What works in conservation? Lessons from conservation evidence’ in due course. Accumulating and summarising this evidence is therefore very much a dynamic and ongoing process, and new or omitted studies will be reviewed for inclusion on an annual basis. We therefore urge you to publish and disseminate any studies that may contribute to this endeavour, either through www.ConservationEvidence.com or other journals and publications. Let’s continue to work together to do the right thing for these amazing species!

References:

Priority Amphibian and Reptile Conservation Areas (PARCAs):
Creative Uses for Conservation - a free webinar
Thursday, October 16, 2014  10:30 am
Presented by: Dr. Joseph J. Apodaca of Warren Wilson College & Dr. Stephen Spear of The Orianne Society

As the threats facing our natural resources continue to increase at an exponential rate, conservation organizations must quickly evolve to meet these challenges. An effective approach to preserving biodiversity is the protection of viable populations of priority species and areas that contain viable populations for a high number of species.

Members of the Orianne Society, Warren Wilson College, Partners for Amphibian and Reptile Conservation (PARC), and the South Atlantic Landscape Conservation Cooperative (SALCC) have worked collaboratively to develop model criteria for designating Priority Amphibian and Reptile Conservation Areas (PARCAs) for the southeastern United States.

The PARCA idea is loosely based on the Important Bird Areas (IBAs) movement. IBAs target areas essential to bird conservation and have arguably been one of the most successful conservation programs in the world. The southeastern PARCA project is expected to raise the profile of high priority species or areas, increase public awareness of locally important conservation areas, and elevate the importance of proper management at these sites.

In this webinar hosted by NCSU Extension Forestry, the presenters will discuss the development of PARCAs, areas of the southeastern United States likely to be designated as PARCAs, and how state and federal agencies can use PARCAs to conserve amphibians, reptiles, and their habitats. Please visit the following site for further information on ongoing PARCA projects: http://parcplace.org/publications/parcaspriorityamphibianandreptileconservationareas.html

For link to join the webinar, see http://separc.wordpress.com/2014/09/04/creative-uses-for-conservation-a-webinar-on-priority-amphibian-and-reptile-conservation-areas-parcas/
From Beneath the Concrete Jungle—Amphibian Crossings
By Matthew Charnock

As any well-practiced “herper” knows, one of the most “concrete”—and yes, pun intended—ways of spotting nocturnal, ectothermic organisms is to drive slowly down a country road, aiming a glaring spotlight over the passing asphalt. But this clever use of our ever-growing infrastructure highlights the dangers posed at amphibians attempting to seek new dwellings. “Frogger” isn’t just a fictional, pixilated game anymore—it’s right in front of your headlamps.

Amphibians are temporal, highly migratory creatures by the nature of their being. It’s this characteristic that places, more than so often, the oblivious anuran underneath the tire path of a passing automobile. And this dismal factoid is no more prevalent than during an amphibian’s breeding season. “Why did the frog cross the road—to partake in some amplexing, of course?”

But never doubt the will-power of ecocentric individuals. From developing traffic signs stating that amphibians are near to constructing subterranean tunnels that bypass the problem completely, countless animals are now safe—and mating. But let’s focus on the latter, shall we?

Studies have shown the effective use of subterranean culverts and tunnels to bypass heavily-trafficked roads and other infrastructural dangers. So effective, in fact, that those populations where road crossings were prevalent saw, on average, a 50% drop in asphalt-affiliated deaths. But it also needs to be noted that the benefit of these tunnels came down to mainly two variables—design and location.

Rest easy, Kermit. You don’t have to play “Frogger” anymore—just take the tunnel. And bring your friends.

Traffic signs, like the example pictured above, give drivers, bikers, etc. time to not only slow their current speed, but to simultaneously become mindful of the amphibians they may or may not encounter as well. Photo by Javier Montero.

Upcoming Meetings & Events

Traveling Year of the Salamander Art Exhibit, September 14-October 19, City of Austin’s Beverly Sheffield Education Center at Barton Springs, Austin, TX. Opening reception September 14, 6 pm.

Save the Frogs! Wetland Construction Workshops, with Tom Biebighauser and Kerry Kriger.
October 13: Ben Lomond, CA
October 14: Shingle Springs, CA, east of Sacramento
October 15 & 16: San Francisco Bay area, CA
See http://savethefrogs.com/ponds/workshops.html for more info & registration.


The Wildlife Society annual meeting, October 25-30, David Lawrence Convention Center, Pittsburgh, PA. http://wildlifesociety.org/schedule-at-a-glance/

PARC symposium “15 and Forward: Reflections on 15 Years of Successes, and the Future of Partners in Amphibian and Reptile Conservation”, October 28, 1:30-5:30 pm, as part of TWS annual meeting, Pittsburgh, PA.

PARC and ARC* reception, October 28, 6-8:00 pm, as part of TWS annual meeting, Pittsburgh, PA.

*ARC - Amphibian and Reptile Conservancy
The Japanese Clawed Salamander, *Onychodactylus japonicus*, an Asiatic salamander in family Hynobiidae, is found in only two places in the world - the islands of Honshu and Shikoku in Japan. Japanese Clawed Salamanders occupy moist, cool, shady mountain habitats near springs or waterfalls, and are usually found beneath rocks, tree roots, or down wood. They breed down within the substrate of clear, cold streams. At first glance, this salamander appears to be similar to many others, as it is relatively small and slim, 4 to 8 inches (10 to 20 cm) total length, the larvae are aquatic, and the adults are terrestrial. However, this salamander is highly unusual in that it has palatine teeth and “amphibian claws.” These claws, which are keratinized features at the tips of the toes, are present in larvae, and breeding adults have them only during the breeding season. Larvae also have external gills that are replaced by fully developed lungs by the time they reach adulthood.

Ongoing taxonomic work is still teasing out species relationships in this family, and several new species have been recently recognized. In addition, there are a large number of threatened species (Vulnerable, Endangered, or Critically Endangered, as classified by the IUCN Red List, www.iucnredlist.org) in this family, including 15 species in the genus *Hynobius*, more than 40% of its members. Even among Hynobius that are not yet considered threatened, many more species are decreasing in population. Many hynobiid species have very limited distributions, which renders them vulnerable to even small losses of habitat or populations. Approximately half of hynobiids are endemic to Japan, often to only a small area of a single island.

### Family: Hynobiidae

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<thead>
<tr>
<th>Also known as:</th>
<th>Asiatic Salamanders</th>
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<tbody>
<tr>
<td>Number of Species:</td>
<td>66 species in 10 genera, most in <em>Hynobius</em> (35 spp.) and <em>Onychodactylus</em> (10 spp.)</td>
</tr>
<tr>
<td>Region / Habitat:</td>
<td>distributed across Asia, from European Russia to Japan</td>
</tr>
<tr>
<td>Physical Characteristics:</td>
<td>relatively small, ranging from 4 inches to 8 inches in length</td>
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<td></td>
<td>- the have “amphibian claws” or keratinization in their toes</td>
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<td></td>
<td>- Presence of palatine teeth arranged in a V-shape</td>
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<td></td>
<td>- the larvae have external gills while most adults have well-developed lungs (except for two lungless species)</td>
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<tr>
<td>Behavior / Development:</td>
<td>nocturnal</td>
</tr>
<tr>
<td></td>
<td>- external fertilization (spawning); females lay eggs on spermatophores in water</td>
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<td></td>
<td>- some males guard the egg sacks</td>
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<tr>
<td>Fun Fact:</td>
<td>There are no Asian salamanders in the fossil record.</td>
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