

differing oxygen availabilities. Metabolic rates were determined using a closed respirometer technique, in which oxygen consumption by the snails induced a progressive hypoxia.

At 15°C four of the species tested were found to have metabolic rates dependent on P_{O_2} (metabolic oxygen conformers); the other seven species had metabolic rates that were independent of P_{O_2} (metabolic oxygen regulators). At 25°C all of the species tested were metabolic oxygen regulators. Habitat was not correlated with the abilities to regulate V_{O_2} , a finding that is contrary to earlier investigations. The ability to regulate appeared to be morphologically based, with prosobranch species able to regulate V_{O_2} over a wider range of oxygen tensions and more perfectly than pulmonate species. Among the pulmonate species, the planorbids, which have hemoglobin in their blood, are better metabolic oxygen regulators than pulmonates that lack hemoglobin. This study demonstrates that freshwater snails in general are able to tolerate low ambient oxygen tensions, and therefore it is concluded that habitat selection in this group is not determined by oxygen availability.

ECOLOGY AND ZOOGEOGRAPHY OF SOME MAINLAND CHINESE *TRICULA* (GASTROPODA: PROSOBRANCHIA: POMATIOPSIDAE) TRANSMITTING SCHISTOSOMES. K. Elaine Hoagland,¹ Yuanhua Kuo,² George M. Davis,³ Pulin Chen,² Hongmu Yang,⁴ and Deji Chen,⁵ ¹Academy of Natural Sciences of Philadelphia, and Lehigh University, Bethlehem, Pennsylvania; ²Institute of Parasitic Diseases, Chinese Academy of Medical Sciences, Shanghai, P.R. China; ³Academy of Natural Sciences of Philadelphia; ⁴Yunnan Provincial Anti-Epidemic Station, Kunming, P.R. China; ⁵Dali Anti-Schistosomiasis Institute, Xiaguan, Yunnan Province, P.R. China.

There are numerous species of *Tricula* and closely-related genera in Southern China and Southeast Asia. Based on previous work, we believed that both the number of taxa in Yunnan Province and the potential for these taxa to transmit mammalian schistosomes were underestimated. This was the case. We found eight species of *Tricula* (delineated anatomically) in the areas of Dali, Kunming, and Jinghong. Although never sympatric congeners, species of *Tricula* lived with closely-related genera at three localities.

One large (7–8 mm) species of *Tricula* lived on stones in a creek and in a culvert draining into Dianchi Lake, with a few specimens in the lake itself. This species differed from other *Tricula* in being able to withstand polluted water with high silt burden. It carried no schistosomes. The other species of *Tricula*, all ~ 3 mm long, lived in mountain springs or tiny creeks and pools below springs. They were found in gently-flowing, clean, cool water. Some individuals were amphibious, but most were in flowing water, if only a hillside seepage. The snails were on undersides of leaves and stones, and on the mud itself. Associated fauna often included *Gyraulus*, *Radix*, *Sphaerium*, insect larvae, flatworms, and leeches.

Tricula was never in stagnant water or streams larger

than ½ meter wide. Habitats were highly localized, small, and isolated yet permanent, perhaps accounting for high speciation in the geographically-widespread genus.

Forked-tail mammalian-type schistosomes infected three species of *Tricula*. Many of the snail habitats, in canyons where there was natural vegetation, suggest that rats could be the final host. Humans may come into contact when obtaining water for domestic use. Chinese *Tricula* is ecologically similar to *Tricula* in Burma, India, and to a related genus in Malaysia that transmits human schistosomes. If the Chinese snails transmit human schistosomes, transmission patterns differ from those of *Oncomelania hupensis*, the amphibious snail transmitting *Schistosoma japonicum* that is associated with irrigation ditches in much of Southern Asia.

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THE LIMPET GENUS *BRONDELIA* AMONG THE FRESHWATER GASTROPODS. J. B. Burch, Smithsonian Institution, Washington, D.C.

Bourguignat (1853 [1854] *Proceedings of the Zoological Society of London*, (21): 92) described a curious limpet-like gastropod, *Ancylus drouetianus*, from the Cuming collection. The shells lacked any indication of a locality, but Bourguignat believed them to be from North America. The shells were peculiar in that they were decorated with a number of radiating reddish stripes, and because of the apex: "mamillato, minutissimo, coarctato, adpresso, recurvo (*culmine 1, 2 spiraliter laterali*), mediano, postico" [italics mine] (Bourguignat, 1862, *Revue et Magasin de Zoologie*, ser. 2, 14: 20). Bourguignat received additional specimens from Algeria and, in the latter publication, named a new genus for the snail, *Brondelia*, clearly differentiating it from *Ancylus*. In the same paper, Bourguignat named a second species, *Brondelia gibbosa*. This species also "a été recueillie sur des rochers humides, dans l'intérieur de la forêt de l'Édough, près de Bone, en Algérie."

In June 1973, I traveled to Algeria with two assistants to collect in the Édough Forest near Bône (Annaba). The forest was not overly disturbed by human activities, the snail habitats were good, and various snail species were collected with little difficulty. We were able to collect widely in the area. But, after several full days of searching, no gastropods resembling *Brondelia* were found (see Brown, 1980, *Freshwater Snails of Africa and Their Medical Importance*, Taylor & Francis, London, p. 143).

Because of the failure to find *Brondelia* at the only specific locality ascribed to either of its two species, I became suspicious about the identity of this supposed ancylid. On inspecting Bourguignat's specimens a short time later from the Muséum d'Histoire naturelle, Geneva, it was obvious that *Brondelia drouetiana* was a species of the siphonariid genus *Williamia* Monterosato. On comparing Bourguignat's specimens with specimens of *Williamia* in the Muséum National d'Histoire naturelle, Paris, it was clear that *Brondelia drouetiana* was identical to *Williamia gussonii* (Costa).

Since *Williamia* Monterosato 1884 (type species: *An-*

cylus gussonii Costa 1829) is predated by *Brondelia* Bourguignat 1862, *Brondelia* will replace the generic name *Williamia* in the Siphonariidae.

CHARACTERS AND CLASSIFICATION—A PRELIMINARY REVIEW OF THE GENERA IN THE SUBFAMILY OCTOPODINAE. Ronald B. Toll, Department of Biology, University of the South, Sewanee, Tennessee.

The subfamily Octopodinae includes the shallow water, common octopuses. The group has gone without a comprehensive systematic revision since Robson's monumental study published in 1929. Uncertainties concerning the validity of many of the genera have resulted in the common, largely uncritical usage of about twelve generic names within the body of octopodine literature. This classification shows strongly skewed levels of monotypicity with *Octopus* comprising well over 100 species and all other genera having five or less nominal species. At least five genera are monotypic.

Preliminary results of a study on the morphologic variability of selected octopodine characters suggest that a substantial number of the genera are invalidly described. The principal problem associated with the present generic classification is the typological concept originally employed to erect many of these taxa. It is now seen that a number of character states used to establish and delineate genera actually represent points along character continua that extend across several genera or the subfamily as a whole.

A review of the genera of octopodines, now underway, should result in a reduction of the number of valid taxa and decreased levels of monotypic skewedness.

SYSTEMATICS OF *GONATUS TINRO* FROM THE SOUTHEASTERN BERING SEA. C. G. Bublitz and T. Nishiyama, Institute of Marine Science, University of Alaska, Fairbanks.

Seven species of oegopsid cephalopods were identified from an examination of 2,244 immature specimens from the southeastern Bering Sea. The species identified included: *Gonatus onyx*, *G. berryi*, *G. madokai*, *G. middendorffi*, *G. tinro*, *Berryteuthis magister* and *B. anonychus*. Of these species, the literature lacks information on the specific characteristics of immature *G. tinro*. Juveniles of *G. tinro* are commonly identified as *B. magister*.

The specific characteristics of immature *G. tinro* were determined from an examination of 181 specimens ranging in size from 6.7 to 68.3 mm PL. The results show that immature *G. tinro* can be separated from other members of the genus on the basis of arm and tentacle armature development. Juvenile *G. tinro* have 5–6 transverse rows of suckers on the oral surface of the tentacular stalk and arm hook development commencing at about 18 mm PL. Club armature maturation starts around 16 mm PL and is completed by 30–35 mm PL. *Gonatus berryi* develops mature club and arm armature at 7–9 mm PL. *Gonatus middendorffi* has four regimented rows of suckers on the proximal portion of the

manus followed by four staggered rows on the oral surface of the stalk.

Separation of *G. onyx* and *G. tinro* in the size range less than 10 mm PL is difficult to make on the basis of sucker counts or morphometrics. Both species from this study had five to six rows of juvenile tentacular stalk suckers with the total number of suckers showing considerable overlap. When enhanced by staining the developing hook bud of *G. onyx* can be distinguished at 8–11 mm PL and is the most reliable method of separation.

Juvenile *Gonatus tinro* and *Berryteuthis* spp. were separated by scanning electron microscopic examination of radulae. The results show that specimens with five to six transverse rows of suckers on the tentacular stalk and arm hook development starting at about 18 mm PL were *G. tinro*. Those specimens with four scattered transverse rows of stalk suckers and no arm hook development evident were *Berryteuthis* spp.

CATALOG OF WORLDWIDE CEPHALOPOD RESOURCES: A PREVIEW. Clyde F. E. Roper and Michael J. Sweeney, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

An annotated and illustrated catalog of the cephalopod species of interest to fisheries around the world has been prepared for publication by the Food and Agriculture Organization of the United Nations (FAO). It includes information on scientific and vernacular nomenclature, synonymy, specific characters, geographic distribution, habitat and biology, and current or potential use as a fishery resource for 172 species (47 sepioids, 89 teuthoids, 34 octopodids, 2 nautiloids). The catalog is available from: Fishery Resources and Environment Division, FAO Fisheries Department, Viale delle Terme di Caracalla, 00100 Rome, Italy.

DISTRIBUTION AND ABUNDANCE OF SQUIDS CAUGHT IN SURFACE GILLNETS IN THE SUBARCTIC PACIFIC, 1977–1981. Tsunemi Kubodera, Nakano-Ku, Tokyo, Japan.

A total of 21,550 squids was obtained from 1,286 gillnets set by Japanese salmon research vessels in the northwestern North Pacific during May to August 1977–1981 and in the Gulf of Alaska in July 1980–1981. Eight species and one genus were identified. *Ommastrephes bartrami*, *Onychoteuthis borealijaponica* and *Gonatopsis borealis* were the most common species, comprising 46%, 33% and 20% of the catch, respectively.

Seasonal changes of distribution and abundance of the three common species in the surface waters of this region were closely correlated with the heating of surface waters and the development of vertical thermal gradients during summer.

G. borealis is distributed broadly in the Subarctic Region from spring to summer; the southern boundary of occurrence shifts to the north by about 4°–5° of latitude during summer. Apparently this species does not form massive schools or large concentrations. *G. borealis* has two



Burch, J. B. 1984. "The Limpet Genus *Brondelia* Among the Freshwater Gastropods." *American malacological bulletin* 2, 88–89.

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