



**Mekong River Commission**

# Distribution and Ecology of Some Important Riverine Fish Species of the Mekong River Basin

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# Summary

The fishery of the Mekong River is one of the largest and most significant in the world, and most of the production is based on migratory river fishes. An earlier report provided an overview of the general patterns of fish migrations and their significance for management. This complementary report provides more detailed information on 40 key species which are significant in the Mekong River fishery. For each species we provide notes on distribution, feeding, size, population structure, critical habitats, life cycle and its importance in fisheries. The information presented is mainly from surveys carried out throughout the lower Mekong Basin over the period 1995-2001 by fisheries agencies in each country, coordinated by the MRC Fisheries Programme and funded by Danida. The report also references other relevant published information.

Fish migrations of the Mekong fall within three broad “systems”, that is general patterns of migration found among many species, which overlap, but generally coincide with the three main parts of the Mekong Basin (upper, middle and lower). The largest migrations involve cyclic and predictable movements of huge numbers of fish between the annually-inundated floodplains (where most fish production originates) and their dry-season refuges in rivers. Fish also move into spawning areas within the river system (usually upstream) from their dry season refuges, generally at the start of the flood. A further type of more passive migration is the downstream drift of millions of fish fry, which originate from key riverine spawning areas. These fry feed, grow and drift in the rising waters, and then colonise and grow in flooded areas.

Not all of the 40 species discussed are currently important in fisheries, because some have already declined in abundance and range as a result of overfishing or changes to hydrology and habitat, caused principally by dam construction. Several species are significant for their large size. Three of the species we discuss are endangered or critically endangered, an indication of the seriousness of impacts on fish stocks and the need for more effective conservation and environmental management. Eight of the species we discuss are endemic to the Mekong, so are of particular interest.

Conservation of fisheries is a key element of sustainable development. The challenge is to provide improved goods and services from other sectors, such as agriculture, forestry, water supply, sanitation and electricity, while sustaining the fishery upon which so many people depend. It is intended that this report will be of value for those who need to assess the impacts of policies and projects on fisheries and their environment. The report also serves as a starting point for researchers on fish and fisheries who will quickly perceive the many gaps in our knowledge.

Further work is urgently required in many areas. For example, effective fisheries management depends upon delineation of stocks, on which we have little information at present. Even at the species level, confusion persists as can be seen from the discussions on several species presented here. Thus further taxonomic and population genetic work should be supported. Other research on individual species should cover life history, spawning habitats, and confirmation of migrations, all basic research which needs increased support in the Basin.

Several large species have declined greatly in catches, and there is little doubt that some types of fishing have contributed greatly to the decline. Apart from still-prevalent illegal methods, such as explosives and poisons, some legal methods, in particular gill nets are causing increasing impacts which must be reduced by co-management between fishers and agencies, and improved regulations and enforcement. Fishery management requires improvement in many other areas also, so support for fisheries agencies in each country is needed.

But the overriding threat to the future of the Mekong's fish and fisheries is the impact of water management schemes, for such purposes as irrigation, hydroelectricity and flood control. The role of flooding as a trigger for spawning, the importance of access to flooded areas, and the need for fish to migrate between widely separated habitats are clear from the species reviews presented here. Hence the focus in future should be on promoting dialogue between fisheries agencies and those responsible for water management, and on any other measures which will result in improved environmental management for conservation of the Mekong System's fisheries.

## សង្ខេប

នេសាទនៅក្នុងទន្លេមេគង្គ ដែលជាទន្លេយ៉ាងធំមួយមានសារៈសំខាន់ណាស់ក្នុងពិភពលោក ។ ត្រីនេសាទបានភាគច្រើនជាប្រភេទត្រីធ្វើចរាចរនៅតាមដងទន្លេ ។ របាយការណ៍មុនបានរៀបរាប់អំពីលក្ខណៈទូទៅនៃការធ្វើចរាចរត្រី និងសារៈសំខាន់ក្នុងការគ្រប់គ្រង ។ របាយការណ៍នេះផ្តល់ព័ត៌មានលម្អិតបន្ថែមអំពីត្រី ៤០ប្រភេទសំខាន់ៗក្នុងនេសាទនៃអាងទន្លេមេគង្គ ។ ប្រភេទត្រីនីមួយៗ ត្រូវបានធ្វើកំណត់សំគាល់អំពីរបាយការណ៍ ទំហំ ហ្វូង ទីជំរកសំខាន់ៗ វដ្តជីវិត និងសារៈសំខាន់ក្នុងវិស័យជលផល ។ ព័ត៌មាននៅពេលបច្ចុប្បន្ននេះបានមកពីការស្រាវជ្រាវរបស់ភ្នាក់ងារជលផលនៅក្នុងប្រទេសនីមួយៗក្នុងអំឡុងឆ្នាំ ១៩៩៥-២០០១ ដែលសំរាប់សំរួលដោយកម្មវិធីជលផលនៃគណៈកម្មការទន្លេមេគង្គ (MRC) និង ផ្តល់មូលនិធិដោយ ដានីដា (Danida) នៃប្រទេស ដាណឺម៉ាក ។ របាយការណ៍នេះមានទំនាក់ទំនងទៅនឹងព័ត៌មានពាក់ព័ន្ធដែលបានចេញផ្សាយកន្លងមក ។

ការធ្វើចរាចររបស់ត្រីជាទូទៅប្រព្រឹត្តទៅនៅក្នុងប្រព័ន្ធព័ន្ធនៃខ្សែទឹកខាងលើ កណ្តាល និងខ្សែទឹកខាងក្រោមនៃអាងទន្លេមេគង្គ ។ ទោះបីជាយ៉ាងនេះក៏មានប្រភេទត្រីជាច្រើនប្រភេទធ្វើចរាចរឆ្លងប្រព័ន្ធគ្នាទៅវិញទៅមក ។ សកម្មភាពនៃការធ្វើចរាចររបស់ត្រីភាគច្រើន មានទំនាក់ទំនងនឹងវដ្តនៃការធ្វើចរាចររបស់ហ្វូងត្រីរវាងតំបន់លិចទឹកប្រចាំឆ្នាំ (ដែលនៅទីនោះត្រីភាគច្រើនបានកកើត និងលូតលាស់) ។ ត្រីក៏បានធ្វើចរាចរទៅតំបន់ពងកូនក្នុងប្រព័ន្ធទន្លេ (ជាទូទៅនៅតំបន់ខ្សែទឹកខាងលើ) ពីទីជំរកនៅរដូវប្រាំងដែលជាទូទៅនៅពេលចាប់ផ្តើមជំងឺច ។ ពាក់ព័ន្ធនឹងចរាចរត្រីកូនត្រីម្យ៉ាងរាប់លានកូនហូររលួយបណ្តែតមកពីតំបន់ពងកូនសំខាន់ៗនៅខ្សែទឹកខាងលើ ។ កូនត្រីម្យ៉ាងនេះរកស៊ីចំណីលូតលាស់ និង ហូររលួយបណ្តែតមកពីខ្សែទឹកខាងលើ ហើយធ្វើការលូតលាស់ចំណាត់នៅតំបន់ទំនាបលិចទឹក ។

ត្រីចំនួន ៤០ ប្រភេទដែលនេសាទបាននៅក្នុងការនេសាទដោយដោយត្រីមិនមែនសុទ្ធតែជាប្រភេទត្រី ដែលមានសារៈសំខាន់ទាំងអស់នោះទេ ពីព្រោះប្រភេទខ្លះ មានចំនួន និង ទំហំថយចុះដោយសារការនេសាទហួសកំរិត បំរែបំរួលជលសាស្ត្រ និង ទីជំរកដែលបណ្តាលមកពីការសាងសង់ទំនប់ ។ យើងបានធ្វើការពិភាក្សាលើប្រភេទត្រីដែលទទួលរងការគំរាមកំហែង រឺ ទទួលការគំរាមកំហែងយ៉ាងធ្ងន់ធ្ងរ ជាសញ្ញាណដែលទទួលការជះឥទ្ធិពលយ៉ាងខ្លាំងមកលើផលស្តុកត្រី និងមានតំរូវការអភិរក្សអោយមានប្រសិទ្ធភាព និង គ្រប់គ្រងបរិស្ថានអោយបានល្អ ។ យើងក៏បានពិភាក្សាលើប្រភេទត្រីចំនួន ៨ ប្រភេទដែលជាប្រភេទដែលមានតែនៅក្នុងអាងទន្លេមេគង្គ ហើយពុំមាននៅកន្លែងផ្សេងទៀតលើពិភពលោកនេះជាចំណុចគួរអោយចាប់អារម្មណ៍បំផុត ។

ការអភិរក្សធនធានជលផលជាគន្លឹះយ៉ាងសំខាន់ដើម្បីធានានិរន្តរភាពនៃធនធានជលផល ។ ការប្រណាំងប្រជែងគឺ ដើម្បីផ្តល់ផលដែលបានកែលម្អ និង សេវាពីបណ្តាវិស័យផ្សេងៗ ដូចជា កសិកម្ម ព្រៃឈើ ការផ្គត់ផ្គង់ទឹក អនាម័យ និង ចរន្តអគ្គិសនីព្រមពេលជាមួយគ្នានេះក៏ត្រូវរក្សាធនធានជលផលអោយមាននិរន្តរភាព ដែលប្រជាជនជាច្រើនមានជីវភាព រឹងមាំផ្អែកលើធនធាននេះ ។ របាយការណ៍នេះមានសារៈប្រយោជន៍ជាសំខាន់សំរាប់ធ្វើការប៉ាន់ប្រមាណអំពីប្រសិទ្ធភាពនៃ ការអនុវត្តគោលនយោបាយ និង គំរោងជលផល និង បរិស្ថាន ។ វាក៏នឹងជាប្រយោជន៍យ៉ាងសំខាន់សំរាប់អ្នកស្រាវជ្រាវ ត្រី និង ផ្តល់ចំណេះដឹងដែលជាតំរូវការជាមូលដ្ឋានសំរាប់ធ្វើការស្រាវជ្រាវ ។

ក្នុងស្ថានភាពបច្ចុប្បន្ននៅមានកិច្ចការជាច្រើន ដែលត្រូវអនុវត្តជាបន្ទាន់ ដូចជាប្រសិទ្ធភាពនៃការគ្រប់គ្រងជលផល អាស្រ័យលើព័ត៌មានអំពីផលស្តុកត្រី ហើយដែលនៅពេលបច្ចុប្បន្ននេះយើងនៅមានព័ត៌មានតិចតួចណាស់ ។ ព័ត៌មានអំពី ប្រភេទត្រីនីមួយៗ ក៏មានដោយកំរ ដូចជាមានការមន្ទិលសង្ស័យ រឺ ស្រពិចស្រពិលដូចមាននៅក្នុងការពិភាក្សាអំពីប្រភេទ ត្រីជាច្រើន ដែលមាននៅក្នុងអត្ថបទរបាយការណ៍នេះ ។ អាស្រ័យហេតុនេះយើងមានតំរូវការសិក្សាបន្ថែមអំពីប្រភេទត្រី (Taxonomy) និង លក្ខណៈសេនេទិចនៃត្រីដើម្បីជួយបំភ្លឺចង់លំអាំងនេះ ។ ការសិក្សាអំពីប្រភេទត្រីនីមួយៗ គួរសិក្សា អំពីប្រវត្តិជីវិត ទីជំរកពងកូន និងអំពីការធ្វើរោងនៅក្នុងអាងទន្លេមេគង្គ ។

ត្រីធំៗជាច្រើនប្រភេទមានបរិមាណផលនេសាទថយចុះ ហើយដែលជាការជះឥទ្ធិពលពី វិវិធីសាស្ត្រនេសាទមួយ ចំនួន ។ វិវិធីសាស្ត្រនេសាទខុសច្បាប់ដូចជា ការបំពុល ការនេសាទដោយប្រើគ្រឿងផ្ទុះ និង ការនេសាទស្របច្បាប់មួយ ចំនួនដូចជាមនេសាទខ្លះអាចជះឥទ្ធិពលមិនល្អលើធនធានជលផល ហើយដែលត្រូវអនុវត្តសហគ្រប់គ្រងដែលចូលរួម ដោយអ្នកនេសាទ និង ភ្នាក់ងារជលផល រួមទាំងកែលម្អបញ្ជូន និង ពង្រឹងការអនុវត្តច្បាប់ ។ ការគ្រប់គ្រងជលផលក៏ ត្រូវទាមទារអោយមានការកែលម្អ ការគ្រប់គ្រងនៅក្នុងវិស័យផ្សេងៗទៀតដែរ ដែលជួយទ្រទ្រង់ដល់វិស័យជលផលនៅ ក្នុងប្រទេសនីមួយៗ ។

ការគំរាមកំហែងជាចម្បងលើត្រី និងជលផលនៅក្នុងអាងទន្លេមេគង្គនៅពេលអនាគតជាពិសេសបណ្តាលមកពីការ គ្រប់គ្រងទឹក ដូចជា ប្រព័ន្ធធារាសាស្ត្រ វារីអគ្គិសនី និងប្រព័ន្ធគ្រប់គ្រងទឹកជំនន់ ។ ទឹកជំនន់មានតួនាទីសំរាប់ជំរុញដល់ការ បន្តពូជ ត្រីអាចធ្វើរោងទៅកាន់ទំនាបលិចទឹក និង ប្រភេទទីជំរកផ្សេងៗ ដែលមានបញ្ជាក់ដូចមាននៅក្នុងរបាយការណ៍ នេះ ។ អាស្រ័យហេតុនេះការងារដែលត្រូវយកចិត្តទុកដាក់គឺការពិគ្រោះយោបល់គ្នារវាងភ្នាក់ងារជលផល និងបណ្តាស្ថាប័ន ដែលទទួលបន្ទុកគ្រប់គ្រងទឹក និង វិធានការក្នុងការគ្រប់គ្រងបរិស្ថានសំរាប់ការអភិរក្សធនធានជលផលនៅក្នុងប្រព័ន្ធអាង ទន្លេមេគង្គ ។



## ບົດສະຫລຸບຫຍໍ້

ການປະມົງໃນອ່າງແມ່ນ້ຳຂອງແມ່ນບ່ອນນຶ່ງທີ່ຍິ່ງໃຫຍ່ ແລະມີຄວາມສຳຄັນທີ່ສຸດຢູ່ໃນໂລກ, ແລະ ຜົນຜະລິດຂອງປາສ່ວນໃຫຍ່ແມ່ນມາຈາກຈຳພວກປາທີ່ທຳການເຄື່ອນຍ້າຍຕາມລຳແມ່ນ້ຳ. ບົດລາຍງານດ້ານວິຊາການສະບັບກ່ອນແມ່ນໄດ້ເວົ້າເຖິງສະພາບໂດຍທົ່ວໄປໃນການເຄື່ອນຍ້າຍຂອງປາ ແລະ ແນວທາງໃນການຄຸ້ມຄອງ. ບົດລາຍງານເຕັມເຕີມສະບັບນີ້ ແມ່ນໄດ້ປະກອບຂໍ້ມູນທີ່ສົມບູນລະອຽດ ຂອງຊະນິດປາຈຳນວນ 40 ຊະນິດທີ່ເຫັນວ່າມີຄວາມສຳຄັນຫລາຍຕໍ່ການປະມົງໃນອ່າງແມ່ນ້ຳຂອງ. ແຕ່ລະຊະນິດປາ ພວກເຮົາໄດ້ອະທິບາຍເຖິງ ຂອບເຂດທີ່ທົບເຫັນ, ການກິນອາຫານ, ຂະນາດ, ລັກສະນະຂອງປະຊາກອນ, ທີ່ຢູ່ອາໄສສະເພາະ, ວົງຈອນຊີວິດ ແລະ ຄວາມສຳຄັນໃນການປະມົງ. ຂໍ້ມູນຕ່າງໆທີ່ສະເໜີຢູ່ໃນບົດລາຍງານສະບັບນີ້ ສ່ວນຫລາຍແມ່ນມາຈາກຜົນຂອງການສຳຫລວດສຶກສາຢູ່ທົ່ວອ່າງແມ່ນ້ຳຂອງໃນລະຫວ່າງປີ 1995 ຫາ 2001 ໂດຍຂະແໜງການປະມົງຂອງແຕ່ລະປະເທດ ຮ່ວມກັບແຜນງານປະມົງຂອງຄະນະກຳມາທິການແມ່ນ້ຳຂອງສາກົນ (MRC) ຊຶ່ງສະໜັບສະໜູນທຶນໂດຍອົງການ ດານິດາ (Danida). ໃນບົດລາຍງານສະບັບນີ້ກໍ່ຍັງໄດ້ອ້າງອີງໃສ່ບາງເອກະສານ ຂໍ້ມູນທີ່ມີກ່ຽວຂ້ອງອື່ນໆທີ່ໄດ້ເຜີຍແຜ່ອອກໄປແລ້ວນັ້ນ.

ການເຄື່ອນຍ້າຍຂອງປາຢູ່ໃນແມ່ນ້ຳຂອງ ສາມາດແບ່ງອອກຢ່າງກວ້າງໆເປັນ 3 ລະບົບ, ຊຶ່ງເປັນລັກສະນະທົ່ວໄປຂອງການເຄື່ອນຍ້າຍຂອງປາຫລາຍໆຊະນິດທີ່ທົບເຫັນ, ຊຶ່ງອາດຈະມີການເລື່ອມລຳເປັນບາງເຂດແຕ່ໂດຍທົ່ວໄປແລ້ວ ແມ່ນຈະຢູ່ໃນ 3 ພາກສ່ວນໃນອ່າງແມ່ນ້ຳຂອງ ( ພາກເໜືອ, ພາກກາງ ແລະພາກໃຕ້). ການເຄື່ອນຍ້າຍໃຫຍ່ ແມ່ນເກີດຂຶ້ນຢ່າງເປັນຂະບວນຂອງຫລາຍໆຊະນິດພັນປາພ້ອມກັນ ຍ້າຍຈາກບ່ອນທີ່ງຸ່ມນ້ຳຖ້ວມແຕ່ລະປີ (ບ່ອນທີ່ປາຂະຫຍາຍພັນ) ແລະບ່ອນທີ່ປາລີ້ໄພໃນລະດູແລ້ງຕາມລຳແມ່ນ້ຳນອກນັ້ນປາກໍ່ຍັງເຄື່ອນຍ້າຍຈາກບ່ອນລີ້ໄພ ຕາມວັງ ໄປສູ່ບ່ອນປະສົມພັນພາຍໃນລຳແມ່ນ້ຳ (ສ່ວນຫລາຍມັກຈະຂຶ້ນໄປທາງເໜືອ), ໂດຍທົ່ວໄປ ຈະເປັນເວລາທີ່ນ້ຳຖ້ວມເລີ້ມຕົ້ນ. ການເຄື່ອນຍ້າຍອີກແບບນຶ່ງແມ່ນການລ່ອງລົງເປັນຈຳນວນລ້ານໆຂອງລູກປາ ຈາກບ່ອນທີ່ພວກມັນກຳເນີດ(ຂະຫຍາຍພັນ)ຕາມທົ່ງນ້ຳຖ້ວມ ແລະອື່ນໆ ລ່ອງລົງມາຕາມລຳແມ່ນ້ຳ. ລູກປາພວກນີ້ ຈະເຂົ້າໄປອາໄສ ຫາກິນ ຈະເລີນເຕີບໃຫຍ່ ຢູ່ໃນເຂດນ້ຳຖ້ວມຕ່າງໆ.

ໃນຈຳນວນປາ 40 ຊະນິດທີ່ກ່າວມານັ້ນ, ມາເຖິງປັດຈຸບັນບໍ່ແມ່ນທັງໝົດທີ່ຍັງມີຄວາມສຳຄັນ ເນື່ອງຈາກວ່າ ມີບາງຊະນິດກໍ່ນັບມື້ຫລືດຸ່ນຍາດລົງ ຊຶ່ງເກີດຈາກການຈັບເກີນຂອບເຂດ ຫລື ຈາກການປ່ຽນແປງຂອງ ທາງດ້ານອຸທິກກະສາດ ແລະ ທີ່ຢູ່ອາໄສ, ອັນສືບເນື່ອງມາຈາກການກໍ່ສ້າງເຂື່ອນ. ໃນຈຳພວກດັ່ງກ່າວ ມີຫລາຍຊະນິດທີ່ເປັນປາຂະນາດໃຫຍ່. ໃນນັ້ນມີ 3 ຊະນິດທີ່ເປັນຊະນິດພັນປາທີ່ຢູ່ໃນຂັ້ນອັນຕະລາຍ (ໃກ້ສູນພັນ) ຊຶ່ງເປັນຕົວຊີ້ບອກເຖິງອັນຕະລາຍ ມີຜົນກະທົບຕໍ່ ແນວພັນປາ ແລະຮຽກຮ້ອງຕ້ອງການເຖິງການອະນຸລັກ ແລະຄຸ້ມຄອງສະພາບແວດລ້ອມ, ແລະມີ 8 ຊະນິດປາທີ່ເປັນປາສະເພາະຖິ່ນ (ທີ່ມີຢູ່ແຕ່ສະເພາະໃນອ່າງແມ່ນ້ຳຂອງເທົ່ານັ້ນ) ຊຶ່ງເປັນໜ້າສົນໃຈເປັນພິເສດ.

ການປົກປັກຮັກສາການປະມົງ ແມ່ນເປັນຂໍ້ກະແຈແຈທ່າງການພັດທະນາທາງນັ້ນທີ່ຍັງຍືນ. ຄວາມທ້າທາຍ ແມ່ນການທີ່ຈະໄດ້ຮັບການໃຫ້ຄວາມສໍາຄັນຈາກພາກສ່ວນອື່ນໆ ເຊັ່ນ ຂະແໜງການບູກຝັງ, ປ່າໄມ້, ບໍລິການນໍ້າ, ສຸຂະພາລາໄມ ແລະການໄຟຟ້າ, ການຍັງຍືນຂອງຊັບພະຍາກອນປະມົງ ແມ່ນເປັນທີ່ເພິ່ງພາ ຂອງປະຊາຊົນຈຳນວນທີ່ຫລວງຫລາຍ. ຈຸດມັງໝາຍຂອງບົດລາຍງານສະບັບນີ້ແມ່ນເພື່ອເປັນປະໂຫຍດ ສໍາຫລັບຜູ້ທີ່ຕ້ອງການປະເມີນຜົນກະທົບຂອງນະໂຍບາຍ ແລະ ໂຄງການຕ່າງໆ ກ່ຽວກັບການປະມົງ ແລະ ສິ່ງແວດລ້ອມ. ແລະທັງຊ່ວຍໃຫ້ເປັນຈຸດເລີ່ມສໍາຫລັບນັກຄົ້ນຄ້ວາ ກ່ຽວກັບການປະມົງ ຜູ້ທີ່ຈະຕື່ມເຕີມຊ່ອງ ວ່າງຂອງຄວາມຮູ້ທີ່ຍັງມີຢູ່ຫລວງຫລາຍ.

ຍັງມີຫລາຍໆໜ້າວຽກທີ່ຈະຕ້ອງໄດ້ເອົາໃຈໃສ່ໃນຕໍ່ໜ້າ. ຕົວຢ່າງເຊັ່ນ: ການຄຸ້ມຄອງການປະມົງທີ່ມີປະສິດ ທິພາບ ແມ່ນຂຶ້ນກັບການສຶກສາວິໄຈ ທາງດ້ານແນວພັນ, ຊຶ່ງພວກເຮົາຍັງຂາດຂໍ້ມູນທາງດ້ານນີ້ຢູ່ຫລາຍ. ແມ່ນແຕ່ດັບຊະນິດພັນ, ຄວາມສັບສົນ ແມ່ນເກີດຂຶ້ນເລື້ອຍໆ ຊຶ່ງສະແດງອອກໃນການຄົ້ນຄ້ວາສົນທະນາ ໃນຫລາຍຊະນິດປາທີ່ກ່າວມານີ້. ດັ່ງນັ້ນ ວຽກກ່ຽວກັບການຈຳແຍກຊະນິດພັນ (Taxonomic) ວຽກກ່ຽວກັບ ສາຍພັນຂອງປະຊາກອນປາ ຄວນໄດ້ຮັບການຊຸກຍູ້ຕື່ມ. ການຄົ້ນຄ້ວາສະເພາະຂອງແຕ່ລະຊະນິດປາ ຄວນລວມເອົາທັງ ປະຫວັດຊີວິດ, ບ່ອນປະສົມພັນວາງໄຂ່, ແລະ ລັກສະນະການເຄື່ອນຍ້າຍ. ການຄົ້ນ ຄ້ວາພັນຖານເຫລົ່ານີ້ ແມ່ນຮຽກຮ້ອງໃຫ້ເຕີ້ມການຊຸກຍູ້ໃນທົ່ວອ່າງ.

ປາຊະນິດໃຫຍ່ໆຫລາຍຊະນິດແມ່ນໄດ້ຫລຸດໜ້ອຍເລື້ອຍໆ ແລະມີຄວາມສົງໄສວ່າເຄື່ອງມືຫາປາບາງຊະ ນິດ ແມ່ນອາດເປັນສາເຫດຂອງການຫລຸດລົງຢ່າງໜ້າເປັນຫ່ວງ. ນອກນັ້ນການສືບຕໍ່ໃຊ້ເຄື່ອງມືທີ່ຜິດລະ ບຽບ ຫລື ຖືກຫ້າມ ເຊັ່ນ ການໃຊ້ລະເບີດ ແລະຢາເບືອ, ບາງວິທີການທີ່ຖືກຕ້ອງ ເຊັ່ນ ມອງ ແມ່ນເປັນ ສາເຫດທີ່ສໍາຄັນ ທີ່ມີຜົນກະທົບເຕີ້ມຂຶ້ນເລື້ອຍ ຕ້ອງພະຍາຍາມຫລຸດຜ່ອນ ໂດຍການນໍາໃຊ້ການຄຸ້ມຄອງ ຮ່ວມກັນ ລະຫວ່າງພະນັກງານ ແລະຊາວປະມົງ, ພ້ອມກັນນັ້ນກໍ່ຕ້ອງປັບປຸງ ກົດລະບຽບ ແລະການນໍາໃຊ້ ກົດລະບຽບດັ່ງກ່າວ. ການຄຸ້ມຄອງຊັບພະຍາກອນປະມົງ ແມ່ນຮຽກຮ້ອງການຮ່ວມມືຈາກ ຂະແໜງການ ອື່ນໆດ້ວຍ, ສະນັ້ນ ການຊຸກຍູ້ໃຫ້ແກ່ຂະແໜງການປະມົງຂອງແຕ່ລະປະເທດແມ່ນຍັງມີຄວາມຈໍາເປັນ.

ແຕ່ວ່າ ຄວາມສ່ຽງທີ່ສູງຂຶ້ນໃນອານາຄົດທີ່ມີຕໍ່ການປະມົງ ແລະຊະນິດພັນໃນອ່າງແມ່ນໍ້າຂອງ ແມ່ນເປັນ ຜົນກະທົບມາຈາກການຄຸ້ມຄອງໂຄງການພັດທະນາທາງນັ້ນ ເຊັ່ນ ຊົນລະປະທານ, ໄຟຟ້ານໍ້າຕົກ ແລະ ການປ້ອງກັນນໍ້າຖ້ວມ. ບົດບາດຂອງການເກີດນໍ້າຖ້ວມແມ່ນຍິ່ງໃຫຍ່ຕໍ່ການຂະຍາຍພັນຂອງປາ, ຄວາມສໍາ ຄັນໃນການເຂົ້າໄປຫາເຂດນໍ້າຖ້ວມ, ແລະຄວາມຈໍາເປັນໃນການເຄື່ອນຍ້າຍຂອງປາ ຈາກບ່ອນນຶ່ງໄປສູ່ອີກ ທີ່ອື່ນໆແມ່ນໄດ້ອະທິບາຍໄວ້ແຈ້ງໃນບົດລາຍງານນີ້. ໃນຂັ້ນຕໍ່ໄປຄວນເລັ່ງໃສ່ ຊຸກຍູ້ ເຈລະຈາລະຫວ່າງຂະ ແໜງການປະມົງ ກັບຜູ້ຮັບຜິດຊອບຂອງຂະແໜງການທີ່ຄຸ້ມຄອງໂຄງການພັດທະນາທາງນັ້ນ, ແລະມາດ ຕະການຕ່າງໆທີ່ຈະເຮັດໃຫ້ມີການປັບປຸງການຄຸ້ມຄອງສະພາບແວດລ້ອມ ແລະປົກປັກຮັກສາລະບົບການປະ ມົງໃນແມ່ນຂອງໃຫ້ຍັງຍືນຕໍ່ໄປ.

## สรุป

การประมงในแม่น้ำโขงเป็นกิจกรรมขนาดใหญ่ที่สุดและมีความสำคัญที่สุดแห่งหนึ่งของโลก ผลผลิตส่วนใหญ่ขึ้นอยู่กับปลาชนิดที่มีการอพยพเคลื่อนย้ายในลำน้ำ รายงานฉบับก่อนนำเสนอข้อมูลทั่วไปเกี่ยวกับรูปแบบของการอพยพเคลื่อนย้ายของปลารวมถึงความสำคัญของการอพยพเคลื่อนย้ายที่มีต่อการบริหารจัดการประมง รายงานเสริมฉบับนี้นำเสนอข้อมูลเพิ่มเติมของปลาแม่น้ำ ๔๐ ชนิดที่มีความสำคัญต่อการประมงในแม่น้ำโขง โดยให้รายละเอียดเกี่ยวกับการแพร่กระจาย การกินอาหาร ขนาด โครงสร้างประชากร แหล่งที่อยู่ที่สำคัญ วงจรชีวิต และความสำคัญด้านการประมงเป็นรายชนิด ข้อมูลหลักที่นำเสนอได้จากการสำรวจที่จัดขึ้นในลุ่มน้ำโขงตอนล่างระหว่าง พ.ศ. ๒๕๓๘-๒๕๔๔ โดยหน่วยงานด้านการประมงของแต่ละประเทศ ประสานงานโดยแผนงานด้านการประมงของสำนักงานเลขาธิการคณะกรรมการแม่น้ำโขงซึ่งได้รับการสนับสนุนเงินทุนจาก Danida รายงานฉบับนี้ยังอ้างอิงสารสนเทศที่เกี่ยวข้องอื่นที่พิมพ์เผยแพร่แล้วด้วย

การอพยพเคลื่อนย้ายของปลาในแม่น้ำโขงอาจจำแนกได้เป็นสามระบบใหญ่ ๆ ซึ่งเป็นรูปแบบทั่วไปของการอพยพเคลื่อนย้ายที่พบในปลาหลายชนิดที่อาจมีการเหลื่อมซ้อนแต่สอดคล้องโดยทั่วไปกับสามส่วนหลักของลุ่มน้ำโขง (ตอนบน, ตอนกลางและตอนล่าง) การอพยพเคลื่อนย้ายขนาดใหญ่ที่สุด ได้แก่ การเคลื่อนย้ายที่เป็นวัฏจักรและคาดหมายได้ของปลาจำนวนมหาศาลระหว่างเขตที่ราบน้ำท่วมถึงประจำปี (ที่ซึ่งเป็นแหล่งกำเนิดผลผลิตปลาส่วนใหญ่) และแหล่งอาศัยหลบภัยในฤดูแล้งในแม่น้ำ ปลามีการอพยพไปสู่แหล่งวางไข่ในระบบแม่น้ำด้วย (โดยทั่วไปเป็นการอพยพทวนน้ำ) โดยอพยพจากแหล่งอาศัยหลบภัยในฤดูแล้งเมื่อน้ำเริ่มท่วม อีกรูปแบบหนึ่งซึ่งเป็นการอพยพเคลื่อนย้ายตามสภาพแวดล้อมมากกว่า ได้แก่ การล่องลอยตามน้ำของลูกปลาจำนวนมากซึ่งถือกำเนิดมาจากแหล่งวางไข่ในแม่น้ำที่สำคัญ ลูกปลาเหล่านี้กินอาหาร เจริญเติบโต และล่องลอยตามระดับน้ำเข้าสู่พื้นที่น้ำท่วมและรวมกลุ่มและเติบโตในเขตน้ำท่วมดังกล่าว

ปลาทั้ง ๔๐ ชนิดที่อธิบายรายละเอียดนี้ มิได้มีความสำคัญทางการประมงในปัจจุบันทุกชนิด เพราะว่าปลาบางชนิดลดจำนวนลงและระยะทางในการอพยพเคลื่อนย้ายเนื่องจากการประมงที่มากเกินไป หรือจากการเปลี่ยนแปลงทางอุทกวิทยาและแหล่งที่อยู่อาศัย อันมีสาเหตุหลักมาจากการก่อสร้างเขื่อน ปลาหลายชนิดมีความสำคัญเพราะเป็นปลาที่มีขนาดใหญ่ สามชนิดที่กล่าวถึงเป็นปลาที่เสี่ยงต่อภาวะสูญพันธุ์หรือใกล้สูญพันธุ์ ซึ่งบ่งชี้ถึงความรุนแรงของผลกระทบเสียหายต่าง ๆ ที่มีต่อปลา และบ่งชี้ถึงความต้องการแนวทางการอนุรักษ์และการบริหารจัดการสิ่งแวดล้อมที่มีประสิทธิภาพยิ่งขึ้น ปลา ๘ ชนิดในรายงานฉบับนี้เป็นปลาที่มีถิ่นกำเนิดเฉพาะในแม่น้ำโขง ซึ่งควรให้ความสนใจเป็นพิเศษ

การอนุรักษ์ทรัพยากรประมงเป็นประเด็นหลักของการพัฒนาอย่างยั่งยืน สิ่งที่ทำหาย คือ การเพิ่มผลผลิตและบริการจากภาคการผลิตอื่น เช่น เกษตรกรรม การป่าไม้ การให้บริการน้ำ สุขาภิบาล และการผลิตกระแสไฟฟ้า โดยดำรงรักษาผลผลิตภาคการประมงที่ประชาชนจำนวนมากต้องพึ่งพิงในขณะเดียวกัน จึงหวังว่ารายงานฉบับนี้จะมีคุณค่าอย่างยิ่งสำหรับผู้ที่ทำหน้าที่ประเมินผลกระทบจากนโยบายและโครงการต่าง ๆ ที่มีต่อภาคการประมงและสิ่งแวดล้อมประมง รายงานนี้ยังอาจใช้เป็นจุดเริ่มต้นสำหรับนักวิจัยด้านปลาและการประมงผู้ซึ่งจะรับทราบโดยทันทีถึงช่องโหว่จำนวนมากในองค์ความรู้ที่มีอยู่ของเรา

มีความต้องการเร่งด่วนสำหรับงานในอนาคตในหลายสาขาวิชา เช่น การบริหารจัดการการประมงที่มีประสิทธิภาพขึ้นอยู่กับความเข้าใจรายละเอียดขององค์ประกอบประชากรปลา ซึ่งมีสารสนเทศน้อยมากในขณะนี้ หรือแม้แต่ในระดับของชนิดปลา ยังคงมีความสับสนอยู่มากในปลาหลายชนิดที่อธิบายในรายงานฉบับนี้ จึงจำเป็นอย่างยิ่งที่งานด้านอนุกรมวิธานและพันธุศาสตร์ประชากรจะต้องสนับสนุนการแก้ปัญหาดังกล่าว โครงการวิจัยด้านอื่น ๆ ในระดับชนิดปลาควรครอบคลุมประวัติวงจรชีวิต แหล่งขยายพันธุ์วางไข่ และการยืนยันการอพยพเคลื่อนย้าย ซึ่งเป็นงานวิจัยพื้นฐานที่ต้องการการสนับสนุนเพิ่มขึ้นในกลุ่มน้ำโขง

ปริมาณจับของปลาที่มีขนาดใหญ่หลายชนิดลดลงอย่างมาก และเป็นที่ยอมรับว่าลักษณะการทำประมงบางชนิดทำให้เกิดการลดจำนวนลงอย่างเห็นได้ชัด นอกเหนือจากการจับปลาที่ผิดกฎหมายที่พบเห็นอยู่ทั่วไป เช่น การระเบิดปลาและการใช้สารพิษ การจับปลาหลายวิธีที่ถูกกฎหมาย โดยเฉพาะอย่างยิ่ง การวางข่าย ได้ก่อผลกระทบเสียหายมากขึ้นต่อทรัพยากร ซึ่งต้องลดผลกระทบนั้นโดยการจัดการร่วม ระหว่างชาวประมงกับหน่วยงานที่เกี่ยวข้อง และการปรับปรุงระเบียบกฎหมายเกณฑ์มาตรฐานต่าง ๆ รวมทั้งการบังคับใช้ การบริหารจัดการประมงต้องการการปรับปรุงในหลาย ๆ ด้าน ดังนั้น จึงต้องการการสนับสนุนต่อหน่วยงานด้านการประมงในแต่ละประเทศด้วย

แต่ปัจจัยคุกคามต่อประชากรปลาและการประมงในแม่น้ำโขงในขณะนี้ คือ ผลกระทบจากโครงการบริหารจัดการน้ำเพื่อวัตถุประสงค์ต่าง ๆ เช่น การชลประทาน การผลิตกระแสไฟฟ้าจากพลังน้ำและการป้องกันน้ำท่วม บทบาทของน้ำท่วมในการส่งสัญญาณสำหรับการวางไข่ การเข้าถึงเขตน้ำท่วม และความจำเป็นที่ปลาต้องมีการอพยพเคลื่อนย้ายระหว่างแหล่งที่อยู่ที่เหมาะสมได้ อธิบายไว้อย่างชัดเจนในรายงานฉบับนี้ ดังนั้น จุดเน้นในอนาคตควรสนับสนุนให้มีการปรึกษาหารือระหว่างหน่วยงานด้านการประมงและหน่วยงานรับผิดชอบด้านการพัฒนาทางน้ำเหล่านั้น และสร้างมาตรการอื่นใดที่จะส่งผลให้การบริหารจัดการสิ่งแวดล้อมเพื่อการอนุรักษ์ทรัพยากรประมงในระบบแม่น้ำโขงดีขึ้นกว่าเดิม

## **Phân bố và sinh thái một số loài cá dạng sông quan trọng ở sông Mê Công**

### **Tóm tắt**

Nghề đánh cá ở sông Mê Công vào loại lớn nhất thế giới. Sản phẩm khai thác chủ yếu của nó dựa vào sự di cư của cá sông. Báo cáo trước đây đã cung cấp khái quát về các yếu tố chủ yếu của cá di cư và những đặc điểm để quản lý. Báo cáo này bổ sung những thông tin chi tiết về 40 loài cá quan trọng đối với nghề khai thác cá sông Mê Công. Chúng tôi cung cấp đặc điểm về phân bố, tính ăn, kích thước, kết cấu đàn, vòng đời và vai trò của từng loài đối với nghề cá. Những thông tin đưa ra trong báo cáo này chủ yếu lấy từ kết quả điều tra ở hạ lưu sông Mê Công từ 1995 đến 2001 do các tổ chức nghề cá của mỗi nước kết hợp với chương trình nghề cá do Danida tài trợ tiến hành. Báo cáo có sử dụng một số tài liệu tham khảo đã công bố.

Di cư của cá ở sông Mê Công qui vào 3 *hệ thống* lớn, là 3 kiểu di cư tiêu biểu. Cho dù có sự chông chéo đối với một vài loài, nhưng nhìn chung nó phù hợp với 3 vùng chính của sông Mê Công (thượng lưu, trung lưu và hạ lưu). Sự di cư lớn nhất là sự di chuyển mang tính chu kỳ có thể dự báo được của một số lớn các loài cá giữa vùng ngập theo chu kỳ năm (nơi cung cấp sản lượng cá chủ yếu) và nơi cư trú vào mùa khô ở sông. Cá còn di chuyển từ những nơi ẩn náu vào mùa khô đến các bãi đẻ trên sông (thông thường là vùng thượng nguồn) khi bắt đầu mùa lũ. Còn một loại di cư bị động theo dòng chảy của hàng triệu cá bột từ các bãi đẻ chính trên sông. Cá bột này kiếm mồi sinh trưởng trong dòng nước đang lên, cuối cùng chúng định cư và sinh trưởng trong vùng ngập.

Không phải 40 loài cá thảo luận ở đây đều quan trọng cả đối với nghề đánh cá bởi vì một số loài đã không còn chiếm ưu thế do việc khai thác quá mức hoặc do thay đổi chế độ thủy văn, nơi cư trú vì xây dựng đập. Một số loài được quan tâm đặc biệt vì kích thước lớn của chúng. Trong số này có 3 loài được liệt vào loài có nguy cơ tuyệt chủng hoặc nguy cơ đặc biệt – một tiêu chí chỉ ra sự ảnh hưởng nghiêm trọng đối với nguồn lợi và cần thiết phải có biện pháp hữu hiệu để bảo vệ nguồn lợi và quản lý môi trường. Tám trong số các loài thảo luận ở đây thuộc loài đặc hữu của sông Mê Công cho nên chúng cũng được quan tâm đặc biệt.

Bảo tồn nghề cá là một trong những yếu tố then chốt của phát triển bền vững. Sự thách thức là trong khi vẫn đảm bảo cung cấp vật liệu và dịch vụ cho các ngành khác như nông nghiệp, nghề rừng, thủy lợi, y tế và phát điện nhưng lại vẫn duy trì được nghề đánh cá, nghề mà rất nhiều người sống dựa vào. Báo cáo này có giá trị đối với những ai muốn đánh giá sự ảnh hưởng của các chính sách hoặc các dự án đối với nghề đánh cá và môi trường. Báo cáo này còn có thể dùng làm điểm xuất phát cho những nhà nghiên cứu cá và nghề cá, giúp họ linh hoạt nhanh chóng nhiều chỗ trống trong kiến thức hiện nay của chúng ta.

Công việc tiếp theo là đòi hỏi cấp bách thuộc nhiều lĩnh vực. Thí dụ, việc quản lý hữu hiệu nghề cá dựa vào việc mô tả đàn cá mà hiện nay ta có rất ít tài liệu. Ngay ở mức độ loài, sự lúng túng có thể thấy được qua phần thảo luận đối với một số loài ở đây. Vì vậy công tác phân loại và di truyền đàn cá phải được chú ý. Những nghiên cứu khác đối với từng loài cần bao hàm các lĩnh vực như chu kỳ sống, đặc tính sinh sản, di cư. Nói chung những nghiên cứu cơ bản cần phải được chú ý hơn ở toàn lưu vực.

Một số loài cá cỡ lớn đã giảm sản lượng nghiêm trọng, người ta nghi ngờ rằng một số ngư cụ đang sử dụng đã gây nên sự giảm sút này. Đi đôi với những loại ngư cụ bất hợp pháp đang còn sử dụng phổ biến như nổ mìn, đánh thuốc độc thì một số ngư cụ hợp pháp đặc biệt là lưới bện cũng gây ảnh hưởng nghiêm trọng. Những ảnh hưởng này cần phải giảm bớt thông qua đồng quản lý giữa ngư dân và các cơ quan quản lý làm tăng hiệu quả các điều luật và biện pháp cưỡng chế. Quản lý nghề cá đòi hỏi phải cải thiện rất nhiều lĩnh vực, do đó cần thiết phải có sự giúp đỡ cho các cơ quan nghề cá ở mỗi nước.

Nhưng mối đe dọa hơn cả đối với cá và nghề cá ở sông Mê Công là ảnh hưởng do phương thức quản lý nguồn nước như thủy lợi, thủy điện, chống lũ gây nên. Vai trò của lũ là tín hiệu cho cá sinh sản, di cư vào vùng ngập, và là sự cần thiết cho cá di cư giữa các nơi cư trú cách xa nhau đã được trình bày rõ ràng trong báo cáo này. Do vậy tâm điểm chú ý trong tương lai là thúc đẩy sự đối thoại giữa các cơ quan nghề cá và những cơ quan có trách nhiệm quản lý nguồn nước, đồng thời cũng chú ý tới những biện pháp khác có ảnh hưởng đến việc nâng cao quản lý môi trường nhằm bảo tồn nghề cá ở hệ thống sông Mê Công.

# Introduction

The fisheries of the Mekong River System are among the largest and most productive in the world, providing food and livelihoods for millions of people, and the Mekong harbours one of the richest and most diverse fish faunas in the world (Sverdrup-Jensen, 2002). At least 1,200 species are present, representing a wide variety of families with a wide range of morphologies and life histories. Although all fishes are caught at times, only 50-100 species are common in the fishery, which is predominantly based along fertile lowland floodplains, where most people live. In the Lower Mekong Basin (LMB) inland fisheries production is at least 2 Mt./year and probably closer to 3 Mt./year (Hortle and Bush, 2003), making the fishery one of the world's largest. Most of the production is wild fish, and most of the important fishes are migratory "white-fishes", species which spend a significant part of their lives in, and depend upon, rivers.

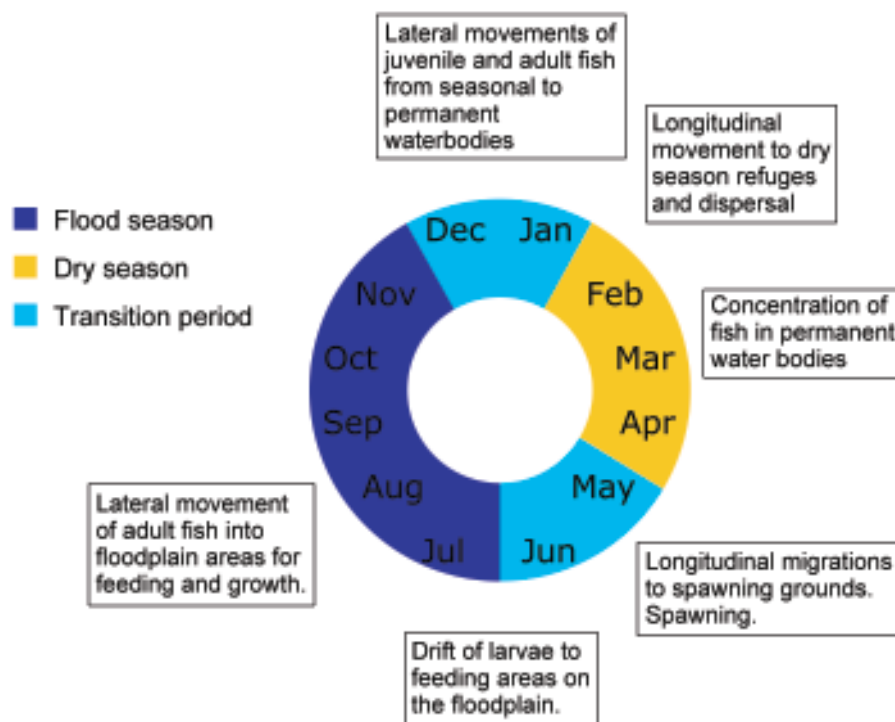
Poulsen et al. (2003) provided an overview of migrations of white-fish in the Lower Mekong Basin. This report provides more details on individual species of white-fish. We do not discuss "black-fishes" (species which spend their lives on the floodplain and associated wetlands), because although locally important in fisheries on floodplains, they do not migrate long distances, their biology is relatively well-known, and they are in general less-threatened by development.

The contents of this report are based mainly on the CD "Fish Migrations in the Mekong Basin" (Visser et al. 2003a), which synthesised data from the Fisheries Programme as well as published literature from other sources.

# Fish Migration

Fish migration involves “movements, which result in an alternation between two or more separate habitats, occur with a regular periodicity, and involve a large proportion of the population” Northcote (1984). Migration is distinguished from more diffuse types of movement such as foraging for food within a single habitat. Migration is an integrated part of the life cycle of an animal. Animals migrate between essential habitats which are separated in time and space. Often, movements are guided by seasonal changes in living conditions (e.g. escaping winters or seasonal droughts) and/or by seasonal reproductive patterns (e.g. migrating to suitable breeding sites). These movements have evolved with, and thus are finely tuned to, the environment within which they occur. Migratory animals depend on a wide range of habitats, and their distribution ranges cover large geographical areas.

**Figure 1: General Life Cycle for Mekong fish species**



Migratory animals are well adapted to naturally occurring environmental fluctuations and changes, but are particularly vulnerable to the abrupt environmental changes caused by human activities. Many migratory species are therefore endangered or at risk of becoming endangered (see [www.redlist.org](http://www.redlist.org)).

Fish migrations cannot be described without describing essential fish habitats at the same time and the environment within which these habitats are embedded. Therefore, impacts of development scenarios on fish migrations are not confined to the blocking of migration routes caused by damming of rivers. Impacts on the environment and changes in hydrological patterns are equally important in their influence on fish habitats, and may be caused by a broad range of factors.



Virtually all fishes of the Mekong are exploited and therefore constitute important fishery resources. All fishes are vulnerable to impacts from development activities, including trans-boundary impacts. However, long distance migratory white-fishes are particularly vulnerable because of their dependence on many different habitats, their extensive distribution area and reliance on migration corridors connecting different habitats. For these important fishery resources, the term 'trans-boundary' has a double meaning: they are trans-boundary resources that may be affected by trans-boundary impacts of human activities.

### **Migratory fishes can be grouped into three main categories:**

1. Anadromous fishes, which live most of their adult life in the sea, but must enter freshwater to spawn;
2. Catadromous fishes have the opposite life strategy. They breed in the sea and enter fresh water where they stay until they are ready to spawn;
3. Potamodromous fishes constitute the most important group in the Mekong, these fishes live their entire life in the river but migrate, often for long distances, within the river system in order to spawn, feed or seek refuge. Potamodromous migrations are either longitudinal or lateral. Longitudinal migrations are along river channels, while lateral migrations are from rivers into floodplain areas. Some species migrate both longitudinally and laterally (e.g. a longitudinal migration to spawning grounds followed by a lateral migration into feeding areas).

Fish typically migrate upstream to spawning grounds when the water level starts to increase, spawning while the water level is still increasing to ensure that the current brings eggs and larvae into nursery areas on the floodplain further downstream. After spawning, the adult fish also move into the flooded areas. During the flood season the fish feed intensively in the flood zone, growing and building up fat layers for the following dry season, when food is scarce. As the water level starts to drop and the floodplain dries, most fish seek refuge in permanent water bodies, mainly in deeper parts of the main river channel. Fish following this pattern thus utilise three distinct habitats (spawning grounds, feeding habitats and dry season refuges).

Triggers for initiation of migrations are not well understood, although some upstream migrations appear to be synchronised with the lunar cycle. It is often suggested that increased discharge in itself is a main trigger for migrations.

The spawning grounds for many Mekong fish species have still not been identified, but large quantities of ripe fish move into many of the tributaries in Lao PDR, Thailand and Northern Cambodia, so it is likely that they contain key spawning habitats fish are spawning there. The major feeding grounds and thus the most important areas for fish production are the huge floodplains in Cambodia and Viet Nam, where many hundred thousand tons of fish are landed every year during migration. Dry season refuges are not very well known in most cases, but one important dry-season habitat is the Mekong mainstream upstream of Kratie in Cambodia where a series of deep pools offer the fish protection in this period. Deep pools further upstream in Lao PDR and Thailand have similar importance.

Migrations have major implications for the fishery in the Mekong Basin. During the flood season the fish are dispersed in a large volume of water and the catch per unit of effort (CPUE) is low. Fishing is therefore mainly for subsistence. During the dry season the fish are very vulnerable to fishing, concentrated in a few refuges and as the dry season progresses stocks become increasingly depleted.

Most fishing effort is during the transition periods when the fish are migrating, especially at the time when the well-nourished fat fish are leaving the floodplains and finding their ways to the dry season refuges in the main river channels. The big surplus of fish caught during this part of the year is traditionally either dried or preserved in other ways - for example in the form of fermented fish. This distributes the supply of fish more evenly over the year.

# Migration Systems

There are three main migration “systems” associated with the lower Mekong River mainstream, discussed in full by Poulsen et al. 2003. The three systems have been termed:

- Lower Mekong Migration System (LMMS): From Khone Falls downstream to the sea, including the Tonle Sap system.
- Middle Mekong Migration System (MMMS): From the Khone Falls upstream to the Loei River confluence, northern Thailand.
- Upper Mekong Migration System (UMMS): Upstream of the Loei River confluence.

In general, the migration patterns within these systems are determined by the spatial separation between dry season refuge habitats and flood season feeding and rearing habitats within each system.

The geographical extent of these three migration systems corresponds with elevation contours of the lower Mekong Basin. In particular, there is an overlap between the extent of the Lower Mekong Migration System and the extent of the 0-149 m elevation of the Mekong Delta/Cambodian lowlands. A correlation also occurs between the Middle Mekong Migration System and the 150-199 m elevation represented largely by the Korat Plateau. The Upper Mekong Migration System correlates with a plateau of 200-500 m elevation. This demonstrates how fish migration has evolved within the surrounding physical environment.

# Future Directions

Preventing the further decline of Mekong fishes is fundamental to sustainable development, as fish and fishing are of central importance to the lives and culture of millions of Mekong people. It is hoped that this report will raise awareness and stimulate further work on the fishes and on their conservation and management.

Further work is urgently required in many areas. Effective fisheries management depends upon delineation of stocks, on which we have little information at present. Even at the species level, confusion persists, as can be seen from the discussions on several species presented here (for example, for even the most common taxon, *Cirrhinus siamensis/lobatus*). Thus further taxonomic and population genetic work should be supported. Other research on individual species should cover life history, spawning habitats, and confirmation of migrations, all of which is basic research which needs increased support in the Basin. Such basic research cannot be entirely neglected in the course of attending to more urgent management issues, because ignorance of basic biology and ecology affects our ability to manage effectively. Building the capacity of scientists in line agencies to carry out and sustain research and management should be a high priority. Research and management should be linked within management plans to ensure both activities are relevant and effective.

Several large species have declined greatly in catches (see Table 1, and species discussions) and there is little doubt that some types of fishing have contributed to the decline. Apart from still-prevalent illegal methods, such as explosives and poisons, ongoing surveys by MRC counterparts in each country show that gill nets continue to increase in number and importance in all areas. Agencies need to control illegal fishing and restrict use of some currently legal gears, such as gill nets. Fishery management will require improvement in many areas (including co-management, aquaculture of indigenous species, and promulgation and enforcement of regulations), which will require support for fisheries agencies in each country.

The overriding threat to the future of the Mekong's fish and fisheries is the impact of water management schemes, for such purposes as irrigation, hydroelectricity and flood control. There is little doubt that this is the main threat to river fisheries worldwide, as can be seen for example by reviewing the many papers submitted to the major Large Rivers Symposium in early 2003; most of the papers mentioned dams and water management as having caused significant impacts on fisheries via impacts on the environment (see papers and abstracts in [www.lars2.org](http://www.lars2.org)). The role of flooding as a trigger for spawning, the importance of access to flooded areas, and the need for fish to migrate between widely separated habitats are clear from the species reviews presented here. To date, there has unfortunately been little effective dialogue between the fisheries sector and those agencies responsible for water management. The measures to manage and mitigate impacts are well-known (e.g. fish passage enhancement, habitat management, riparian flows, water quality management), but have been rarely considered or included in considerations of water management in the LMB (Hortle, 2003). A key to improving outcomes for fisheries is to promote effective dialogue and consultation between all those involved in water management, so that the importance of fisheries is understood, the biology of key species is taken into account, and mitigation and management of impacts are improved.

# Species information

The main purpose of this document is to supplement the earlier report by Poulsen et al. (2003) with more details on individual species. In the following pages 40 species are discussed, and details are given on their distribution and life cycle.

The report follows the following general format.

## **Nomenclature**

The current scientific name (Genus and species) is shown first, followed by the author and date of the original description of the species, which if in brackets, denotes that the current generic name differs from that given by the original authors. The names follow the Mekong Fish Database CD (Visser et al. 2003b), or taxonomic updates as published on [www.fishbase.org](http://www.fishbase.org), which should be used as primary sources for identification of species. The family name and the local names in each of the four national LMB languages follow, and for some species we provide a comment on taxonomy.

**World Distribution:** a summary, based mainly on information in [www.fishbase.org](http://www.fishbase.org).

**Mekong Distribution:** a summary, based on surveys and literature records.

**Feeding:** summarises food and feeding habits, mainly from studies in the LMB.

**Size:** the approximate maximum standard length, with other notes for some species.

**Population structure:** presents hypotheses regarding subpopulations. Most often, the existence of subpopulations is hypothesized when: (1) distribution ranges are interrupted or (2) migration patterns are significantly different between different reaches of the river.

**Critical habitats:** discusses key habitats in the LMB.

**Life cycle:** summarise information on life cycle and migrations in the LMB.

**Fisheries:** summarise information on the importance of the species to fisheries in the LMB.

MRC Data sets used for this report included the following:

1. Local Ecological Knowledge (LEK) surveys from 1999 to 2001.
2. Landing site survey in the Sesan/Srepok Tributary System in 2000.
3. Logbook Migration Monitoring, December 2000 to November 2001.
4. Larvae sampling in Cambodia and Viet Nam, 1999-2001.

Listed data sets from the MRC Fisheries Programme are referenced by a number (in superscript) which refers to the databases shown above.

Occurrence maps are included, wherever available. The migration maps are based on the Local Ecological Knowledge surveys, as well as fish marketing and catch logbook data. The arrows that are shown on the maps do not necessarily indicate a continuous migration movement. Sub-populations may migrate for short stretches before another group moves up or downstream. In order to make this distinction, more research needs to be done, especially in the field of population genetics.

This report focuses on the lower Mekong Basin. Most of the species discussed are widespread so further useful biological and ecological information from other regions is accessible and frequently updated on [www.fishbase.org](http://www.fishbase.org), which also contains much of the information in this report.

The conservation status of fish in this report can be gauged from the IUCN “Red List” which categorises species on a scale of risk of as “threatened with extinction” (critically endangered, endangered or vulnerable), at “lower risk”, or as “data deficient”.

**Table 1. Current IUCN categories for Mekong River Fishes.**

Those discussed in this report are highlighted. From [www.redlist.org](http://www.redlist.org).

Species	English Name	Status
<b><i>Pangasianodon gigas</i></b>	Mekong Giant Catfish	Critically Endangered
<i>Dasyatis laosensis</i>	Mekong Freshwater Stingray	Endangered
<i>Himantura oxyrhynchus</i>	Marbled Freshwater Stingray	Endangered
<i>Pristis zijsron</i>	Green Sawfish	Endangered
<b><i>Probarbus jullieni</i></b>	Jullien’s Barb	Endangered
<b><i>Tenualosa thibaudeaui</i></b>	Laotian Shad	Endangered
<i>Carcharhinus leucas</i>	Bull Shark	Lower Risk
<b><i>Chitala blanci</i></b>	Indochina Featherback	Lower Risk
<i>Redigobius bikolanus</i>	Goby	Lower Risk
<b><i>Pangasius sanitwongsei</i></b>	Giant Catfish	Data Deficient
<b><i>Probarbus labeamajor</i></b>	Thicklip Barb	Data Deficient

It is noteworthy that the six listed species which we discuss were formerly important in the fishery but have declined greatly in abundance, as a result of overfishing and/or changes to habitat, hydrology and fish passage. If fishing impacts are managed, fish stocks can recover, but only if their environment is intact. Thousands of dams and other structures, each with an impact on the river environment, have already been built on the Mekong, and many more are planned. To date there has been little consideration of impacts on river fisheries by agencies responsible for water management, and little incorporation of mitigation or management of fisheries impacts. Careful screening and the incorporation of comprehensive mitigation and environmental management will be necessary in the future to prevent many more species being added to this list, and to prevent the extinction of some species.

## *Aptosyax grypus* Rainboth 1991



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Giant predatory carp
<b>Khmer:</b>	
<b>Lao:</b>	Pa sa nak yai
<b>Thai:</b>	Pla sa nak
<b>Vietnamese:</b>	Ca chao dai

**World Distribution:** Endemic to the Mekong.

**Mekong Distribution:** appears to be limited to the middle Mekong mainstream, from Sambor in Cambodia to Loei in Thailand, possibly also moving into lower reaches of major tributaries. Its distribution may have been significantly reduced, since it has not been seen for many years in the upstream part of its range<sup>1</sup>.

**Feeding:** piscivorous – feeds almost exclusively on fish.

**Size:** up to 100 cm.

### Population structure

Since extremely little is known about the biology of this species, it is not possible to conclude anything on population structure. However, its limited distribution area and migratory habits suggests there may only be a single population.

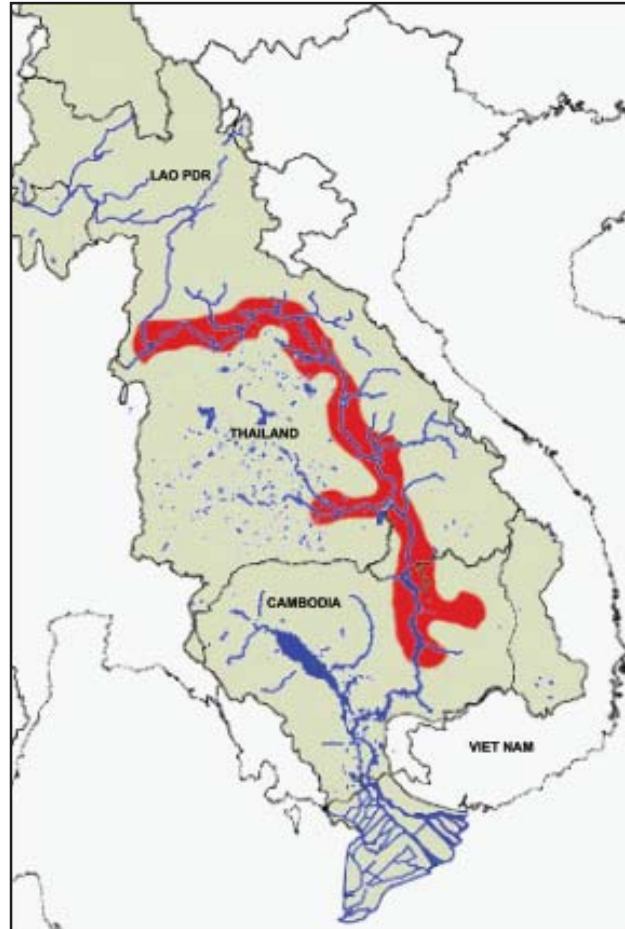
### Critical Habitats

This species probably spends most of its life in deep pools for shelter, feeding and possibly spawning.

### Life Cycle

*Aptosyax grypus* is pelagic and reportedly migrates from December to February in the middle Mekong.

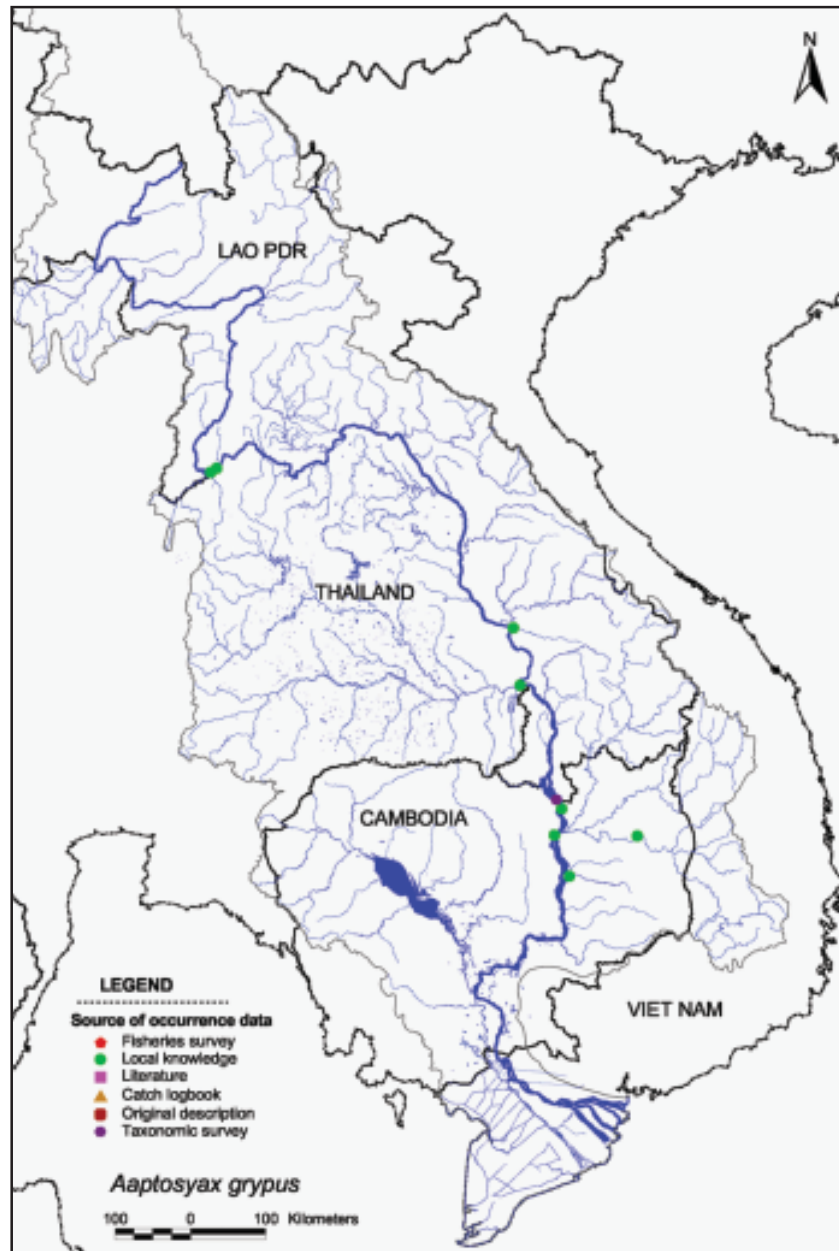
This movement coincides with the timing of upstream migration of small cyprinids in the same stretch of the Mekong River. Since *Aptosyax grypus* is predatory, it is likely that it migrates upstream following its prey. Roberts (1993b) suggested that the upstream migration starting from late December might be a spawning migration. According to Dr. Chavalit Vidthayanon of the Department of Fisheries in Thailand, the species spawns during the dry season in deep pools near rapids in the Mekong mainstream. The few migrating *Aptosyax* that are caught are all big fish and little information is available on juveniles. The only existing report is that of two specimens weighing 100 g, which were caught by gill nets in June 1996 at Ban Hang Khone, southern Lao PDR, just south of the Khone Falls (Baird 1998). Specimens have also been caught in the Songkhram and Moon Rivers in Thailand.



### Fisheries

Although formerly locally important, this species currently does not have any direct significance for fisheries. However, its elusiveness, unique behaviour and peculiar appearance make it a potential flagship species for conservation and management.

<sup>1,2,3,4</sup> See page 20 for information on footnotes



## ***Bagarius yarrelli* (Sykes, 1839)**



<b>Family:</b>	Sisoridae (Sisorid Catfishes)
<b>English:</b>	Goonch
<b>Khmer:</b>	Trey krawbey
<b>Lao:</b>	Pa kaa
<b>Thai:</b>	Pla khae, pla khae ngua
<b>Vietnamese:</b>	Ca chien bac

**World Distribution:** widespread from India through Myanmar and Indochina and south to western Indonesia.

**Mekong Distribution:** basinwide, except for the south-eastern Mekong delta zone. It is found in large rivers with strong current, often among boulders and in the white water of the rapids. It inhabits seasonally inundated riverine habitats in the high-water season.

**Feeding:** carnivorous – feeds on prawns, aquatic insects, small fish, worms and crabs.

**Size:** up to 200 cm.

### **Population structure**

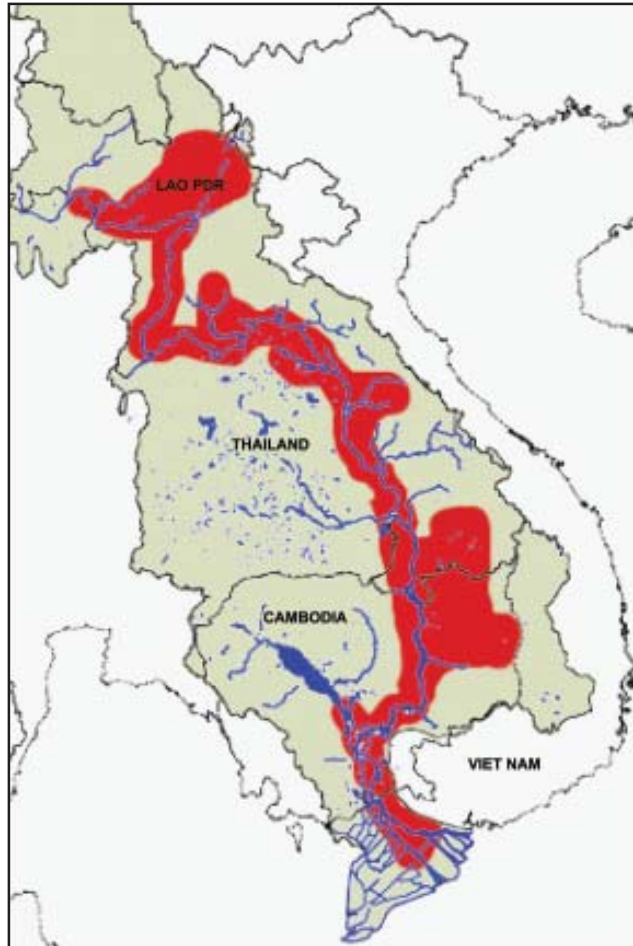
This species is not believed to migrate long distances and therefore probably constitutes many subpopulations.

### **Critical habitats**

In general, *B. yarrelli* prefers habitats with rocks and boulders, which explains why it is relatively rare downstream of Kratie. Little is known about the specific habitat requirements for this species.

### **Life Cycle**

It has been suggested that *B. yarrelli* migrates short distances to follow its prey, which are presumably small, migrating fishes.

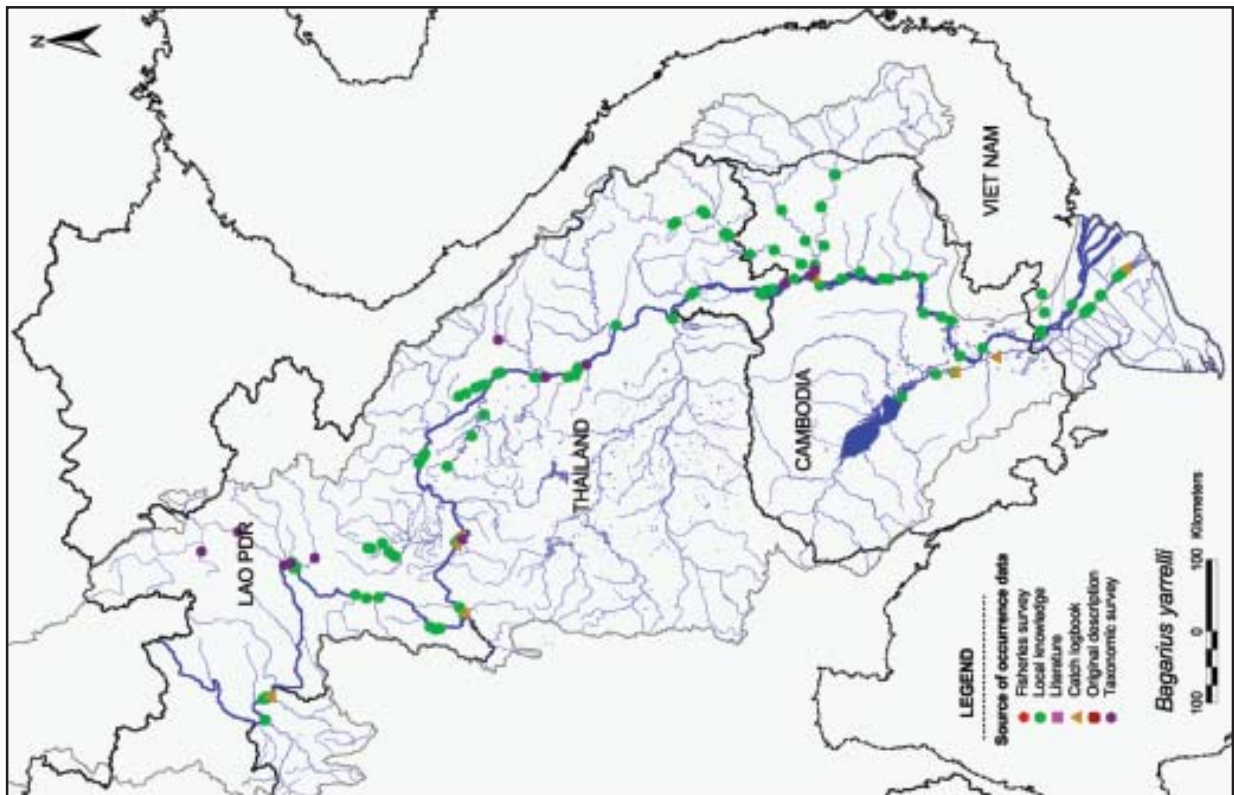
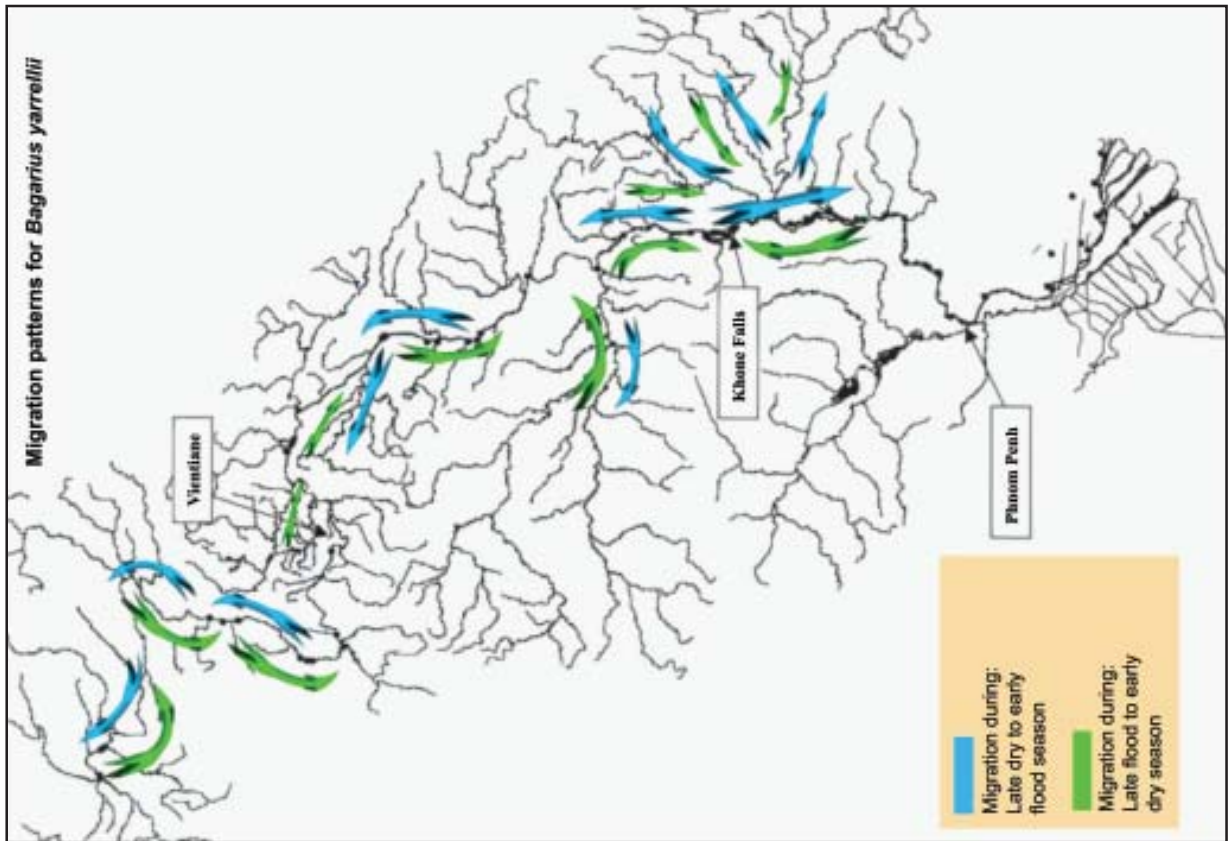


This fish spawns at the beginning of the monsoon season in June-July; it is not known to what degree larvae and juveniles are carried downstream with the current. It probably does not depend on floodplain habitats to the same extent as other Mekong species. During the upstream migration, from March to August in the area upstream from the Khone Falls, fish leave the rocky areas where they live during the rest of the year. The main migration apparently starts close to the peak flood when the current is very strong and the water is still turbid. This coincides with the main spawning season, and is probably therefore a spawning migration.

### **Fisheries**

Except for a few locations in the southern part of the Mekong delta, *Bagarius yarrelli* was identified at all the stations where interviews were carried out<sup>1</sup>. Although Rainboth (1996) stated that it is a relatively unimportant food fish, the species was recorded at five markets during the surveys. Hence it is widespread, but not generally a major element of fisheries.





## *Bangana behri* (Fowler, 1937)



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Two-headed carp
<b>Khmer:</b>	Trey pava mook pee
<b>Lao:</b>	Pa va na nor
<b>Thai:</b>	Pla wha nah naw
<b>Vietnamese:</b>	Ca trang beri

**World Distribution:** Mekong, Chao Phraya and Mae Klong Basins, Thailand.

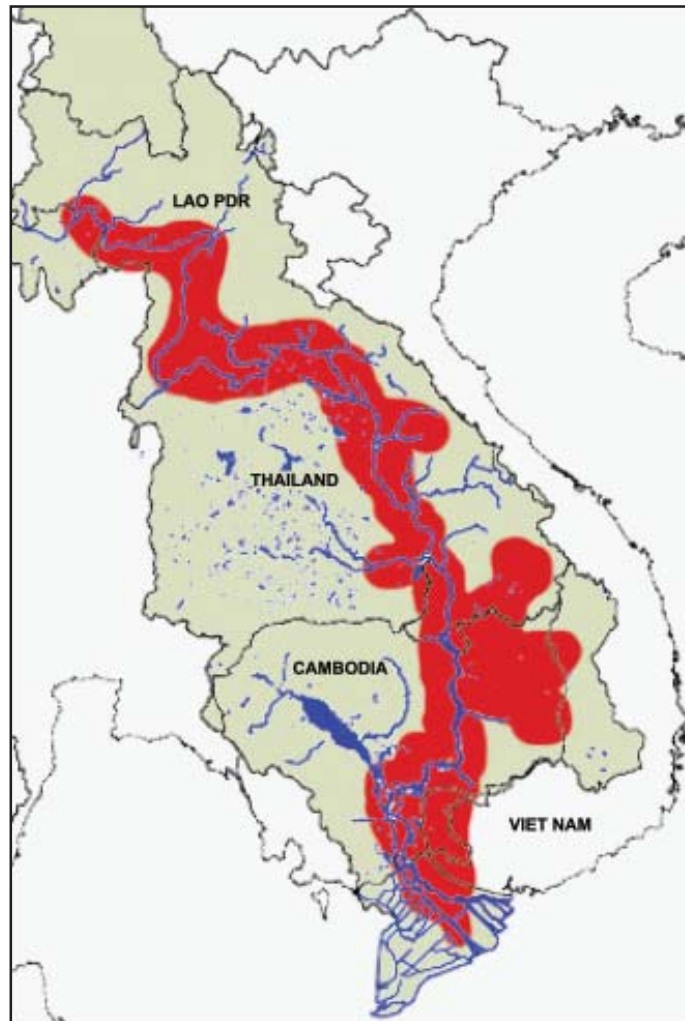
**Mekong Distribution:** occurs from Kratie (Cambodia) to Chiang Khong (Lao PDR and Thailand), including the Sesan/Srepok/Sekong sub-catchment<sup>1,2,3</sup>. This distribution correlates with the occurrence of rocks and boulders within the Mekong mainstream. *Bangana behri* is one of three species in the lower part of the basin that have been referred to as the “pa wa – pa saee complex” (Roberts and Warren, 1994); the other two species being *Labeo* cf. *pirreii* and *Mekongina erythrospila*. This species complex is centered on the Sesan tributary system and the Mekong between Kratie (Cambodia) and Pakse (Lao PDR).

**Feeding:** herbivorous – mainly feeding on phytoplankton, periphyton and algae

**Size:** 45 cm

### Population Structure

*Bangana behri* has a small range compared to many other species, and since it is a migratory species, it may consist of only a few populations, possibly an upper population covering the middle and upper Mekong, and a lower population covering northern Cambodia and the Sesan/Srepok/Sekong catchment. Genetic studies are needed to reveal if this is the case.



### Critical Habitats

The species is mainly associated with stretches of large rivers, where there are many rocks and boulders. This association seems to be the main factor limiting its distribution range. During the dry season, it stays in and around deep pools of the Mekong and its larger tributaries<sup>1</sup>.

### Spawning habitat

A spawning migration of *Bangana behri* has been identified in the Sekong River<sup>1</sup>, which is part of the Sesan catchment. However, little is known about the specific requirements for spawning habitats.

## Life Cycle

Mature fish migrate upstream to spawn at the onset of the flood season<sup>1</sup>. Eggs and/or larvae are believed to drift downstream with the current to their nursing habitats, believed to be flooded vegetation within river channels (very common habitat in the Mekong between Kratie and the Khone Falls).

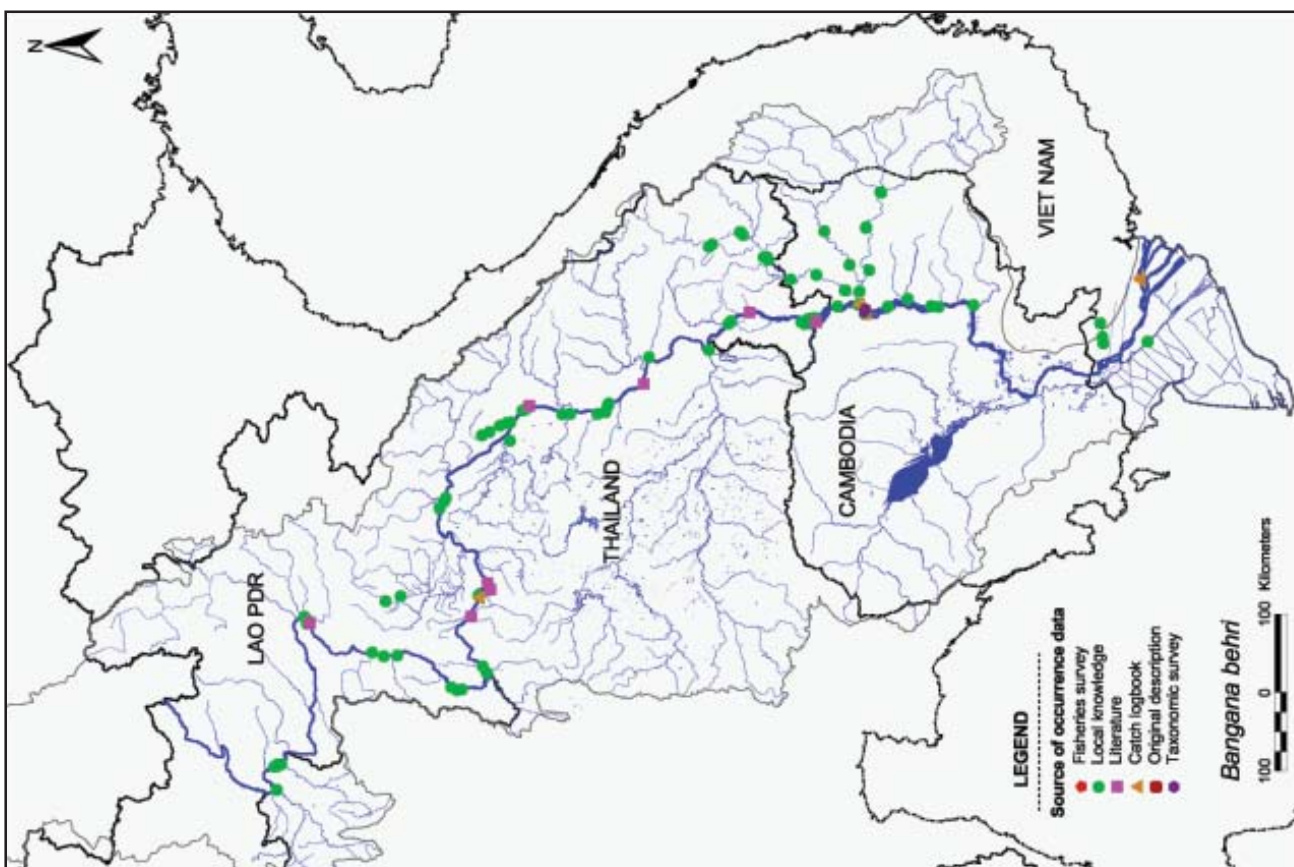
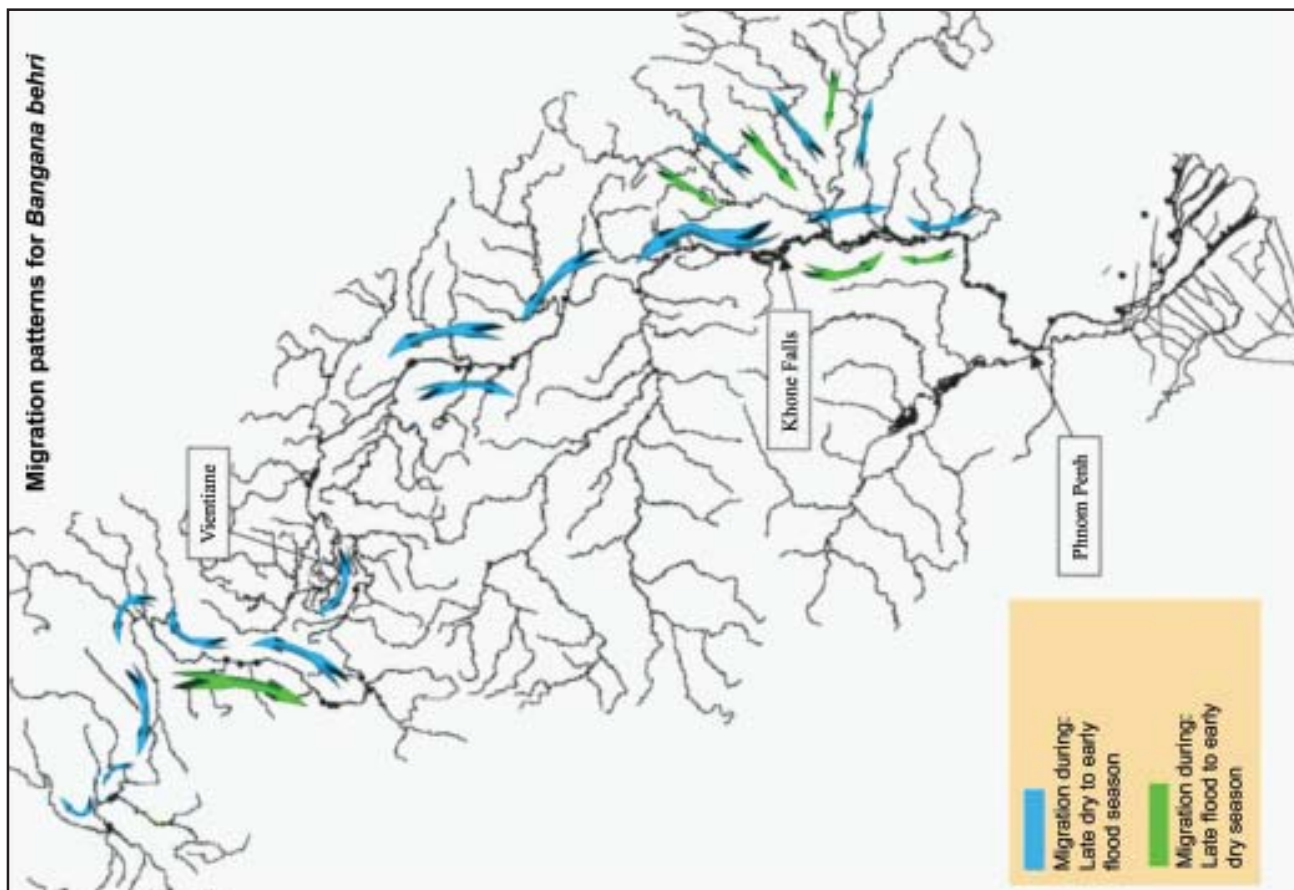
Generally, these migrations occur between the Mekong mainstream (dry season refuge habitats) and the Sesan tributary System (spawning habitats)<sup>1,2</sup>. At the end of the flood season, the young fish move into deep pools of the river channels. These movements continue well into the dry season. Dry-season migrations of *Bangana behri* have previously been reported from just above the Khone Falls between December and February, at which time it becomes one of the most important fish for the fisheries in that area (Warren et al. 1998). These are mainly small specimens with a mean body weight of 275 g. Juveniles of the species, with mean sizes around 100 to 150 g, have also been reported by dry season fisheries at Ban Hang Khone, immediately downstream of the Khone Falls (Baird, 1998). In the upper section of its distribution range, *B. behri* also makes upstream spawning migrations at the onset of the floods<sup>1</sup>. These migrations are triggered by increasing water levels and changes in water colour as a result of increased rain. Local fishermen in the area report that the species migrate in schools together with other cyprinids such as *Labeo cf. pierry*, *Cirrhinus microlepis*, *Labeo chrysophekadion* and *Cyclocheilichthys enoplos*, as well as the loach, *Botia modesta*<sup>1</sup>.

## Fisheries

*B. behri* is important in the fisheries of the Sesan/Srepok and Sekong catchments and the Mekong around Stung Treng<sup>2</sup>. It is mainly caught with gillnets and hook-and-line. In other areas of the basin it is less important.

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<sup>1,2,3,4</sup> See page 20 for information on footnotes



## *Boesemania microlepis* (Bleeker, 1858-59)



<b>Family:</b>	Sciaenidae (Drums or croakers)
<b>English:</b>	Small-scale croaker
<b>Khmer:</b>	Trey Proma
<b>Lao:</b>	Pa Guang
<b>Thai:</b>	Pla Mah, Pla Kueng
<b>Vietnamese:</b>	Ca suu

**World Distribution:** Southeast Asia, Thailand to Sumatra.

**Mekong Distribution:** occurs from the Mekong delta to Luang Prabang in the Lao PDR (Baird et al, 2000), in the mainstream Mekong and its affluents. It is extremely rare in the upper part of the basin<sup>1</sup>. This species is a persistent dry-season inhabitant of deep-water pools in the Mekong River in southern Laos and north eastern Cambodia.

**Feeding:** predatory, feeding mainly on shrimps, insects and fish (Baird et al. 2001)

**Size:** over 100 cm, or 18 kg (Baird, et al. 2001), more commonly around 20 cm.

### Population Structure

*B. microlepis* is considered to be relatively sedentary, so the species probably consists of numerous localised populations.

### Critical Habitats

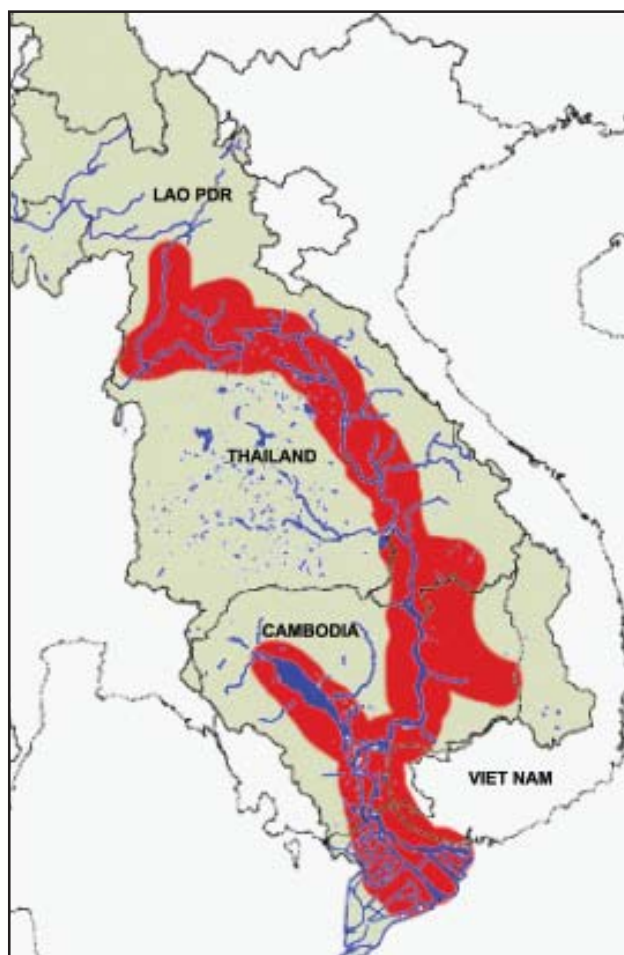
This species is believed to be relatively sedentary, spending most of its life in, or near, deep pools of large rivers<sup>1</sup> (Baird et al. 2001). Juveniles have been found congregating along the edges of sandbanks (Baird et al. 2001).

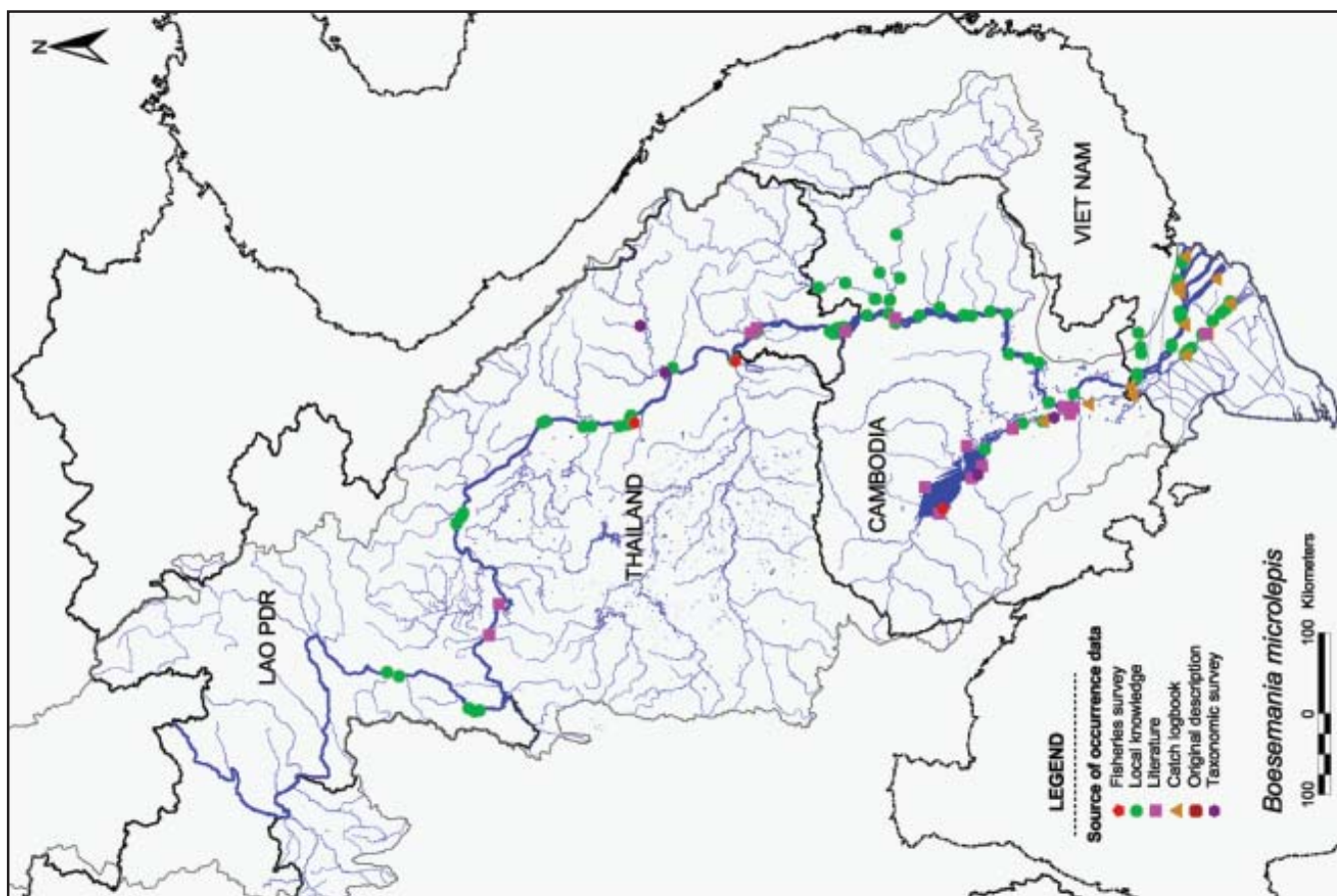
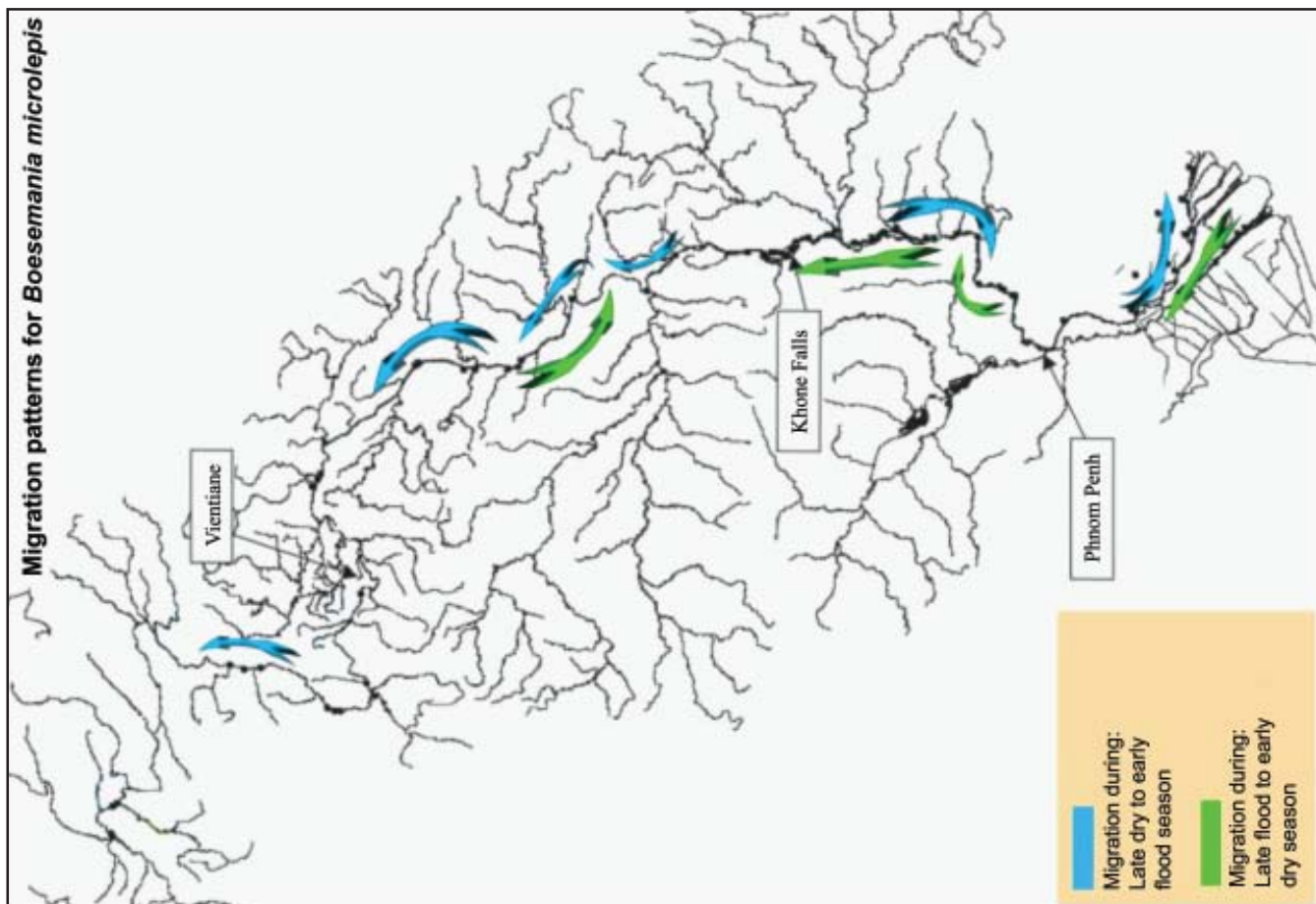
### Life Cycle

*B. microlepis* spawns at the height of the dry season (March to May) in deep-water sections of the Mekong. It croaks loudly as part of its spawning behaviour and, based on hydro-acoustic recording of the vocalisations, seven spawning grounds associated with deep pools have been identified in Khong district, just above the Khone Falls (Baird et al. 2001). A large proportion of its life cycle is spent in deep pools. Small juveniles have been reported to congregate in shallow sandy areas adjacent to riverbanks (Baird et al. 2001). It is not considered a migratory species in a true sense but is reported to undertake shorter, directional movements throughout its range. These movements are probably short “hunting raids” during which the species target schools of migrating fish passing through their area. This is supported by reports from several fishermen throughout the basin stating that the species moves solitarily to hunt migrating fishes<sup>1</sup> (Rainboth, 1996; Baird et al. 2001; Poulsen and Valbo-Jørgensen, 2001).

### Fisheries

*B. microlepis* is an important fish in gillnet fisheries around the Khone Falls (Baird, et al. 2001). It is also caught sporadically in other parts of the basin, particularly in Cambodia and Viet Nam. It is commonly sold dried and salted in markets throughout the lower Mekong Basin.





## *Botia modesta* Bleeker, 1865



<b>Family:</b>	Cobitidae (Loaches)
<b>English:</b>	Redtail loach
<b>Khmer:</b>	Kanchrouk Krawhorn
<b>Lao:</b>	Pa mu man, Pa kheo kai
<b>Thai:</b>	Pla mhu khaao
<b>Vietnamese:</b>	Ca heo vach

**World Distribution:** Mekong, Chao Phraya and Mae Klong Basins, Thailand.

**Distribution:** occurs basin-wide, from the Mekong delta in the South to the border between Lao PDR, Thailand and Myanmar in the North. Found in flowing waters of all sizes in most rivers of the Mekong Basin. It has also been reported in reservoirs.

**Feeding:** carnivorous - feeding mainly on molluscs, benthic insect larvae, worms and crustaceans. It mainly forages for food at night, hiding in holes and crevices during the daytime.

**Size:** up to 25 cm.

### Population structure

Many populations of *Botia modesta* exist in the Mekong, each possibly associated with a different tributary system.

### Critical habitats

*Spawning habitats:* these are not known but are expected to occur in upper reaches of tributaries, or in association with floodplains.

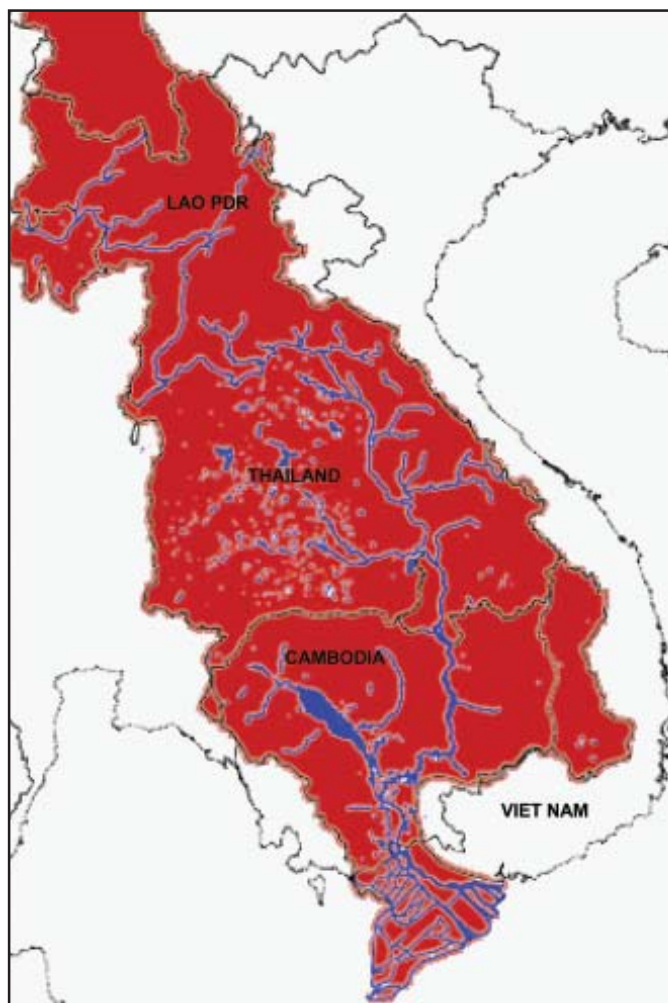
*Feeding habitats:* the young spend their first three-four months feeding and growing in floodplain habitats during the monsoon season. Larger fish may feed extensively on benthic invertebrates in river channels.

*Refuge habitats:* in the dry season, the fish move back to river channels and spend the dry season in deep pools in the Mekong mainstream and the lower reaches of major tributaries.

### Life Cycle

After spawning (May-June), larvae drift with the rising waters to floodplains, where they feed and grow until water begins to recede at the beginning of the dry season. They then move back to the river channels and start their migrations toward their dry season habitats, deep pools in the Mekong mainstream. *Botia modesta* has been reported to migrate together with other migrating species, such as *Henicorhynchus spp.*

Above the Khone Falls, *Botia modesta* migrate into tributaries and streams, where they spawn during the early flood season. Eggs and larvae are swept onto flooded areas, where they develop during the flood season. When the water begins to recede, the fish move back into the main tributaries and the Mekong



mainstream. There may be a limited overlap between different populations in that stretch of the river. Below the Khone Falls, *Botia modesta* also spawns at the onset of the flood season, and eggs and larvae are carried into flooded areas in southern Cambodia and the Mekong delta<sup>4</sup>. Spawning may be limited to the northern part of Cambodia, between Kratie and the Khone Falls. Consequently, the population that inhabits southern Cambodia and the Mekong delta (and possibly the Tonle Sap/Great Lake system) originates from the area that stretches from upstream of Kratie towards the Khone Falls. Separate populations may exist in large tributaries, e.g., the Sesan system.

### **Fisheries**

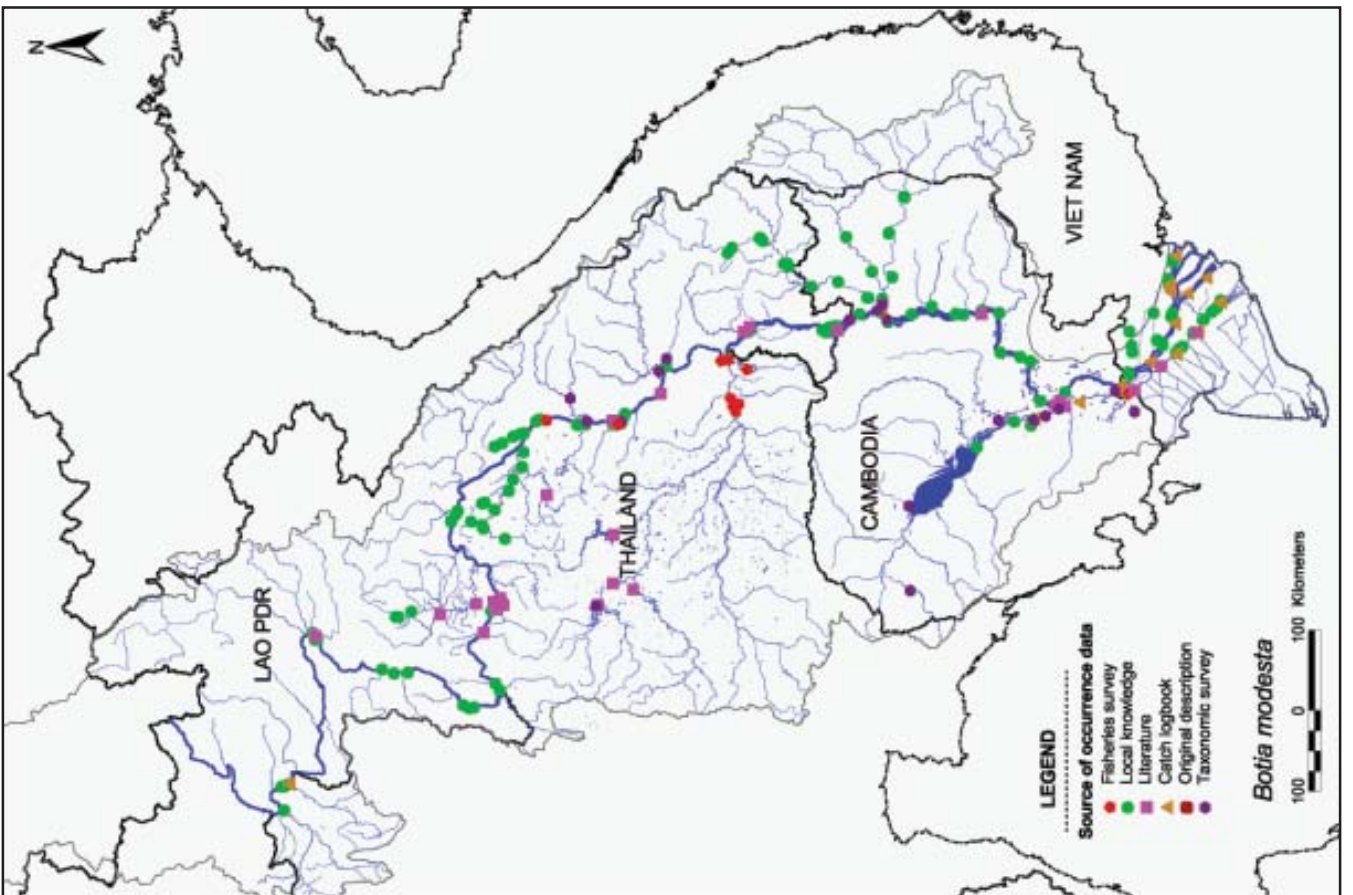
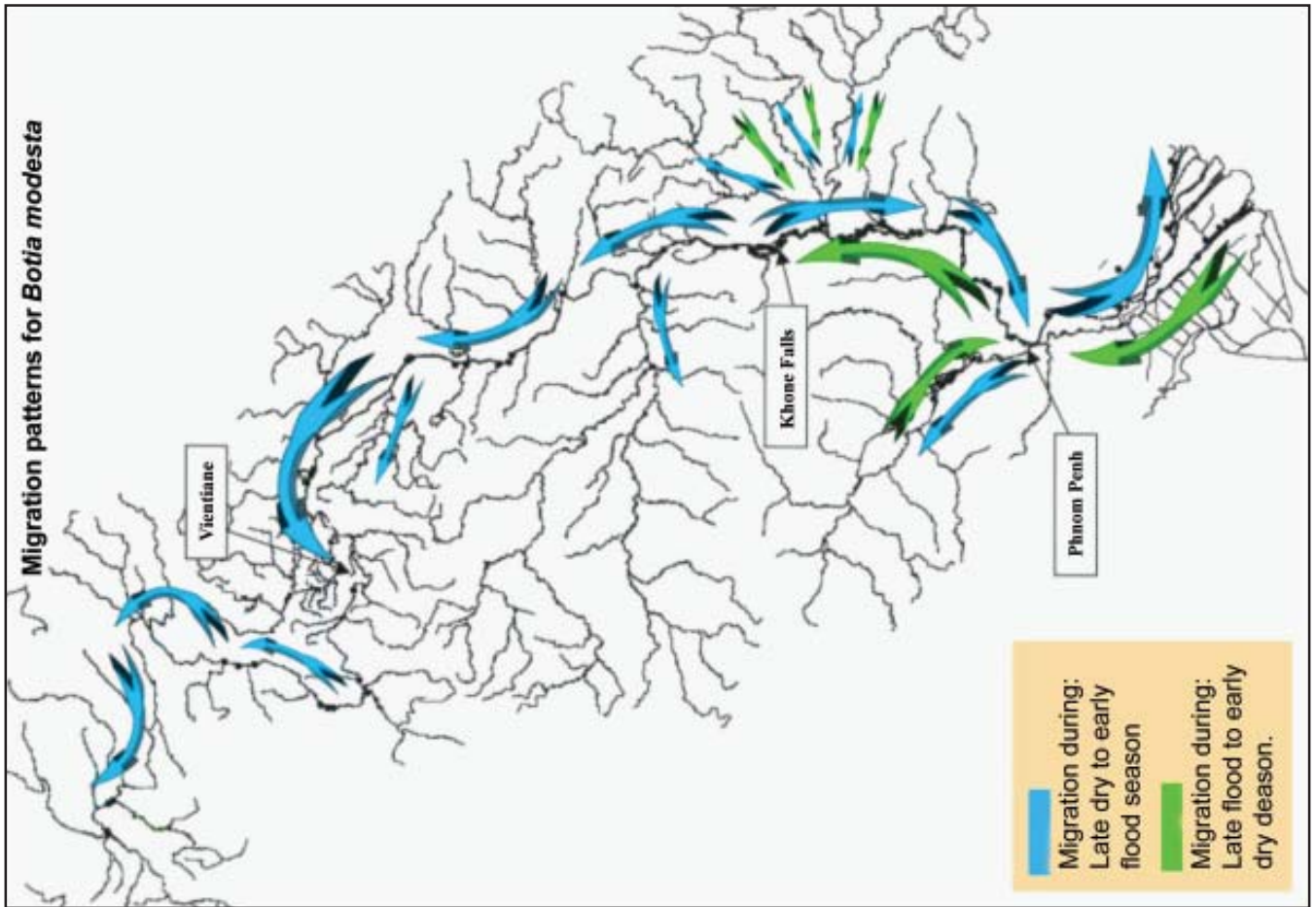
Between January and March, *Botia modesta* is one of the most important species in the specialised *tone* trap fisheries area at Ban Hang Khone, immediately downstream from the Khone Falls (Baird, 1998).

*Botia modesta* is a popular species in the aquarium trade, particularly in Thailand. Since breeding in captivity is still in the experimental stage, the trade is based on the capture of specimens from the wild. One of the most important areas for the capture of aquarium specimens is the Songkhram River in north-eastern Thailand, where the species is believed to spawn in, or near, flood-plain areas at the onset of the flood season.

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<sup>1,2,3,4</sup> See page 20 for information on footnotes





## *Catlocarpio siamensis* Boulenger, 1898



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Giant barb
<b>Khmer:</b>	Kahao, Kolreang
<b>Lao:</b>	Pa ka ho, Pa ka man
<b>Thai:</b>	Ka ho, Ka mun
<b>Vietnamese:</b>	Ca ho

**World Distribution:** Mekong, Chao Phraya and Mae Klong Basins, Thailand.

**Mekong Distribution:** occurs throughout the lower Mekong although it is extremely rare above the Khone Falls. It is more common in Cambodia and Viet Nam, where juveniles are regularly caught in floodplain fisheries, but where large fish are also now rare.

**Feeding:** mainly herbivorous – feeds on algae, phytoplankton and, in the flood season, fruits and terrestrial plants. Occasionally eats small fish.

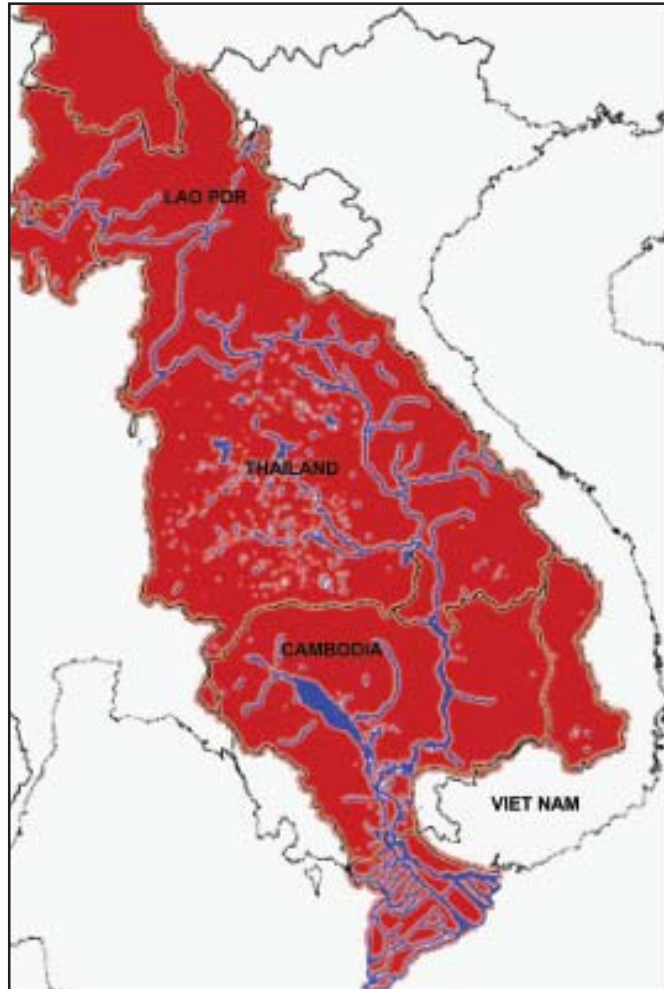
**Size:** This is one of the largest of the Mekong cyprinids, one of the true ‘flagship’ species of the river and grows up to 300 cm (Smith 1945; Rainboth 1996), but more commonly reaches 100-200 cm.

### Population structure

Only one population is believed to occur in the lower part of the basin, i.e. from Khone Falls to the Mekong delta in Viet Nam (including the Tonle Sap catchment). One or more distinct populations possibly occur upstream of the Khone Falls all the way to the upper section of the river. However, due to the extreme rarity of the species in the middle Mekong, it is impossible to reach any firm conclusions regarding population structure from this section.

### Critical Habitats

**Spawning habitats:** little is known about the spawning behaviour and habitat of this species. It has been suggested that spawning occurs in or near floodplain habitats (Smith, 1945; Poulsen and Valbo-Jørgensen, 2001). However, a fisherman from Kratie in Cambodia has reported seeing big fish of the species surfacing in a deep pool near Kratie, a behaviour he interpreted as spawning behaviour (reported at a fishers’ workshop in Kratie, 2001). Although spawning habitat cannot be firmly established based on existing information, deep sections within the river certainly appear to be more appropriate than floodplain habitats as spawning sites for such a large species. Since large individuals are regularly caught at certain times of the year in the Great Lake and Tonle Sap River, spawning may possibly also take place in deep areas of the lake.



*Feeding habitats:* during the flood season, juveniles and sub-adults feed in floodplain habitats and flooded islands within the main river channels. Less is known about feeding of large fish, which probably remain in river channels during the whole seasonal cycle.

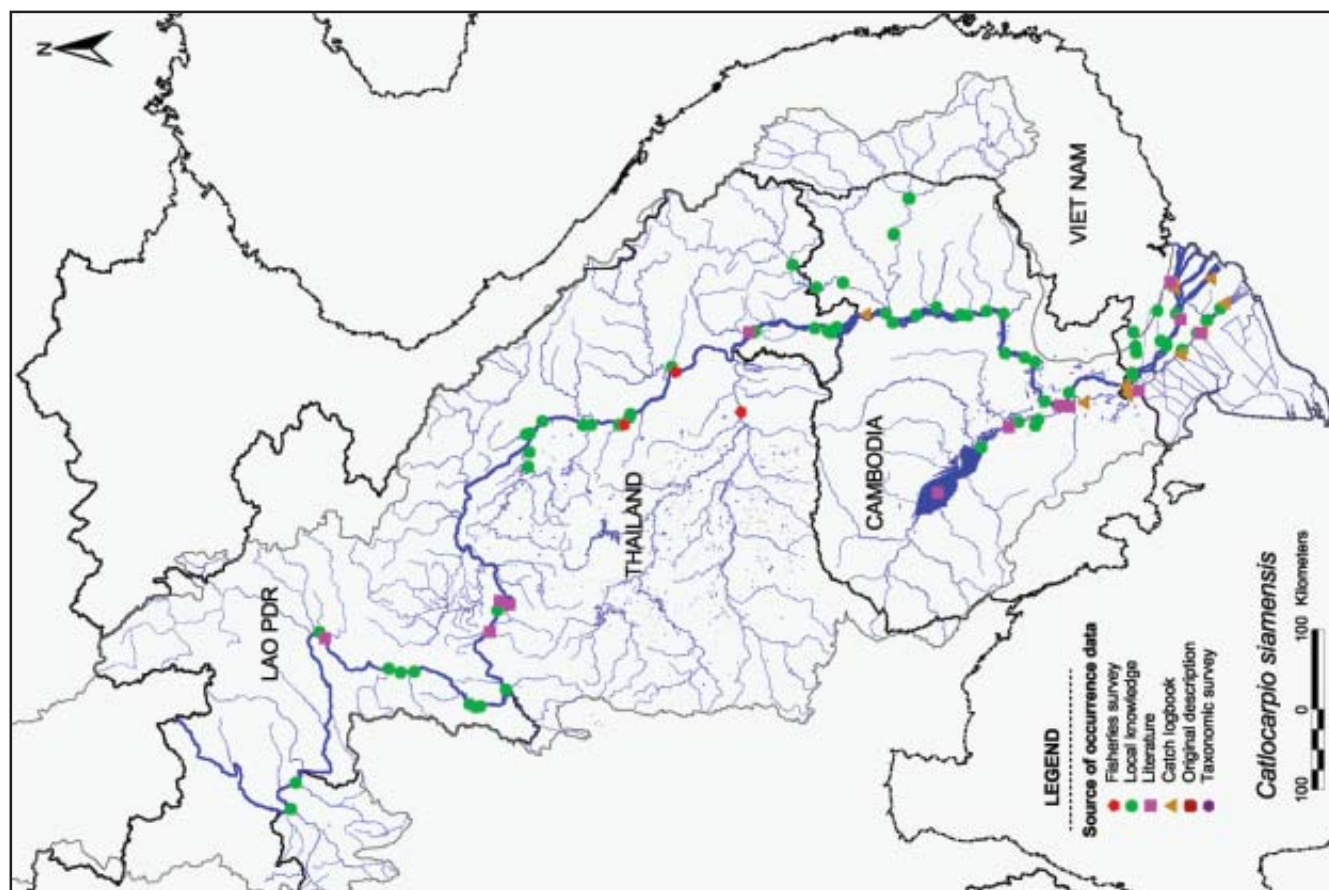
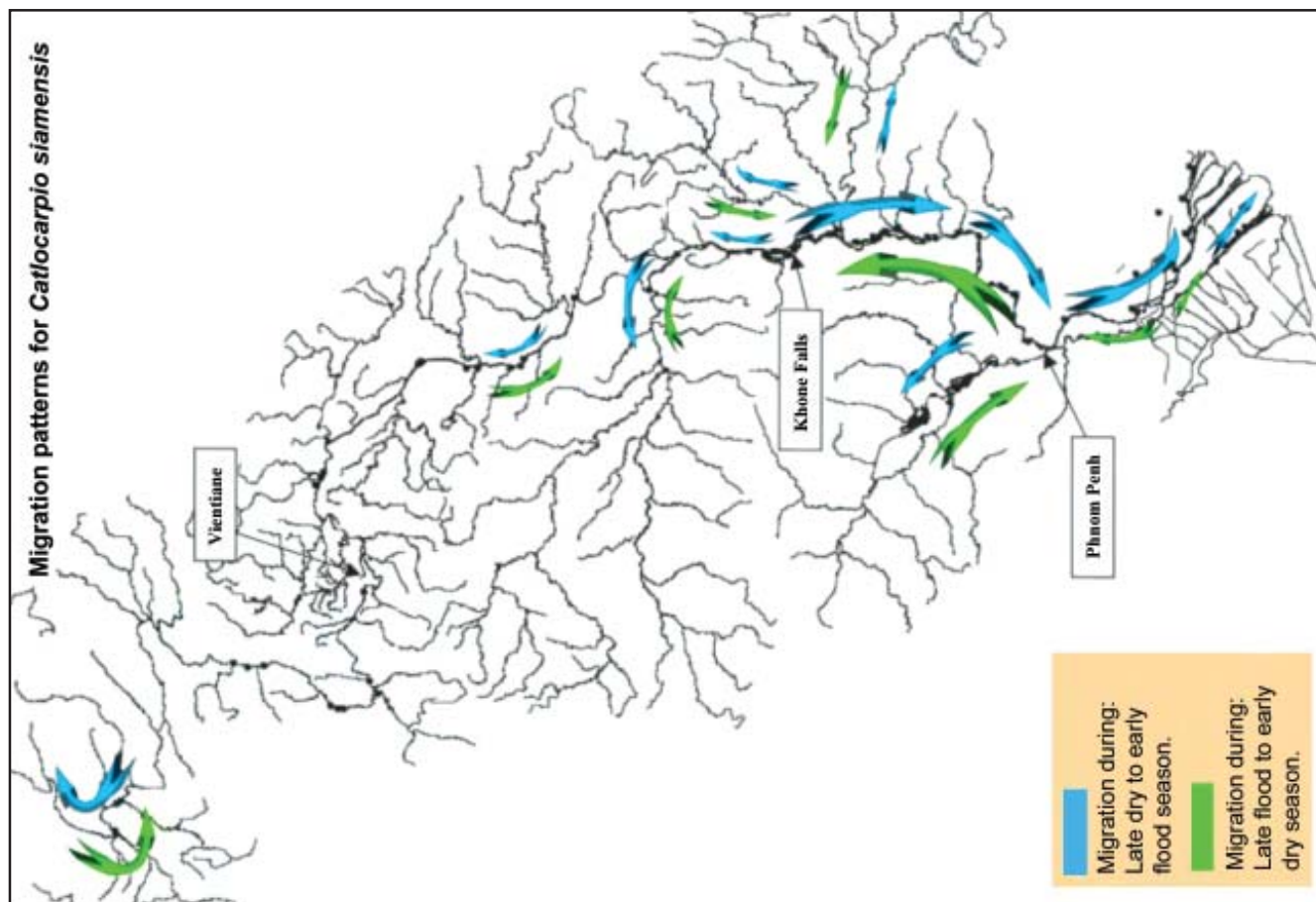
*Refuge habitats:* during the dry season, *Catlocarpio siamensis* seeks refuge in deep pools within the main river channels<sup>1</sup>. Of particular importance in this regard is the stretch from Kratie to Stung Treng<sup>1</sup>.

### **Life Cycle**

A 60 kg. female may produce 400,000 eggs. This species has a similar life cycle to many other migratory species of the Mekong, i.e. it spawns in the Mekong mainstream, eggs and/or larvae drift downstream to their nursing habitat where they grow during the flood season and when the water recedes they move back to the river and migrate to their dry season refuge habitat. However, compared with many other species, this species lives for many years before reaching sexual maturity. Data from local knowledge surveys indicate that the juveniles may return to floodplain habitats for several consecutive years, but after they reach a certain size, they may remain in river channels all year.

### **Fisheries**

Juveniles are caught regularly in floodplain fisheries in Cambodia and Viet Nam. Some larger juveniles are also caught regularly, but in small numbers, in the Tonle Sap *dai* (stationary trawl) fishery (Lieng et al. 1995). Adult fishes are only caught sporadically and are becoming increasingly rare throughout the basin, so this species currently plays an insignificant role in fisheries. In Thailand it is being propagated and stocked in lakes.



## *Chitala blanci* (d'Aubenton, 1965)



<b>Family:</b>	Notopteridae (Featherbacks or Knifefishes)
<b>English:</b>	Indochina featherback
<b>Khmer:</b>	Trey krai
<b>Lao:</b>	Pa tong kai
<b>Thai:</b>	Pla tong lai
<b>Vietnamese:</b>	Ca com bo lang

**World Distribution:** endemic to the Mekong. Listed on the IUCN Red List of Threatened Animals (“lower risk/near threatened”).

**Mekong Distribution:** mainly occurs between Xayaboury in Lao PDR and Kratie in Cambodia<sup>1</sup>. The restricted range is probably a result of its preference for mainstream habitats containing rocks and boulders.

**Feeding:** carnivorous – feeds mainly on insects, crustaceans, earthworms and snails.

**Size:** up to 90 cm.

### Critical habitats

*Spawning habitats:* spawning occurs in stretches of the Mekong mainstream with submerged wood and rocks, on which the eggs are laid<sup>1</sup>. The female fish guard the eggs<sup>1</sup>.

*Feeding habitats:* feeds mainly in the Mekong mainstream and in the Sesan tributary system. However, it may also enter smaller tributaries during the flood season.

*Refuge habitats:* during the dry season it lives in deep pools of the Mekong mainstream<sup>1</sup>.

### Life Cycle

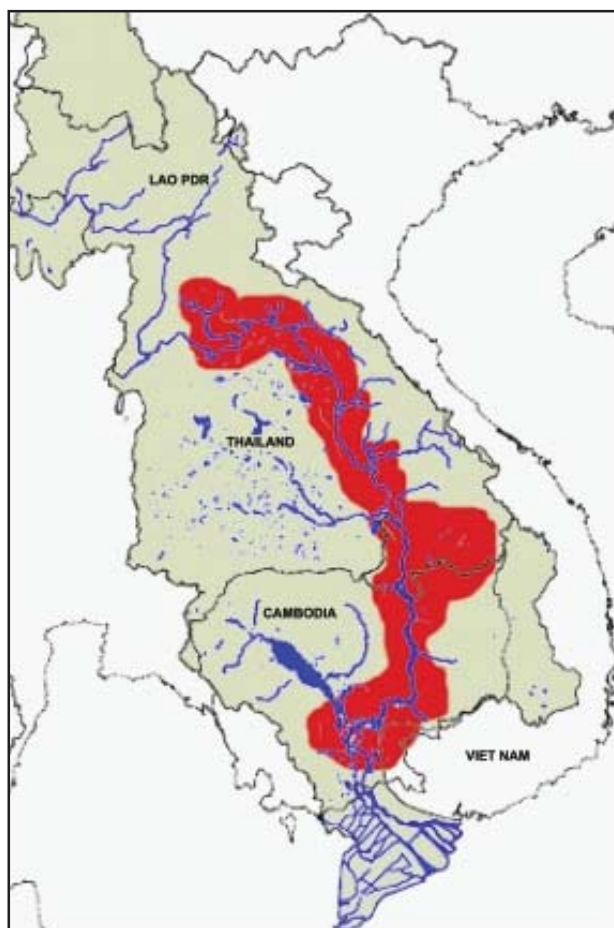
*C. blanci* appears to have an extended spawning season starting in the late dry season in March, and lasting until June. Eggs are attached to submerged wood and larvae and juveniles remain around habitats containing submerged vegetation along the riverbank.

*Chitala blanci* reportedly only undertakes short, local migrations into smaller tributaries when the water level starts to rise, returning to the Mekong mainstream again when water levels begin to recede<sup>1</sup>.

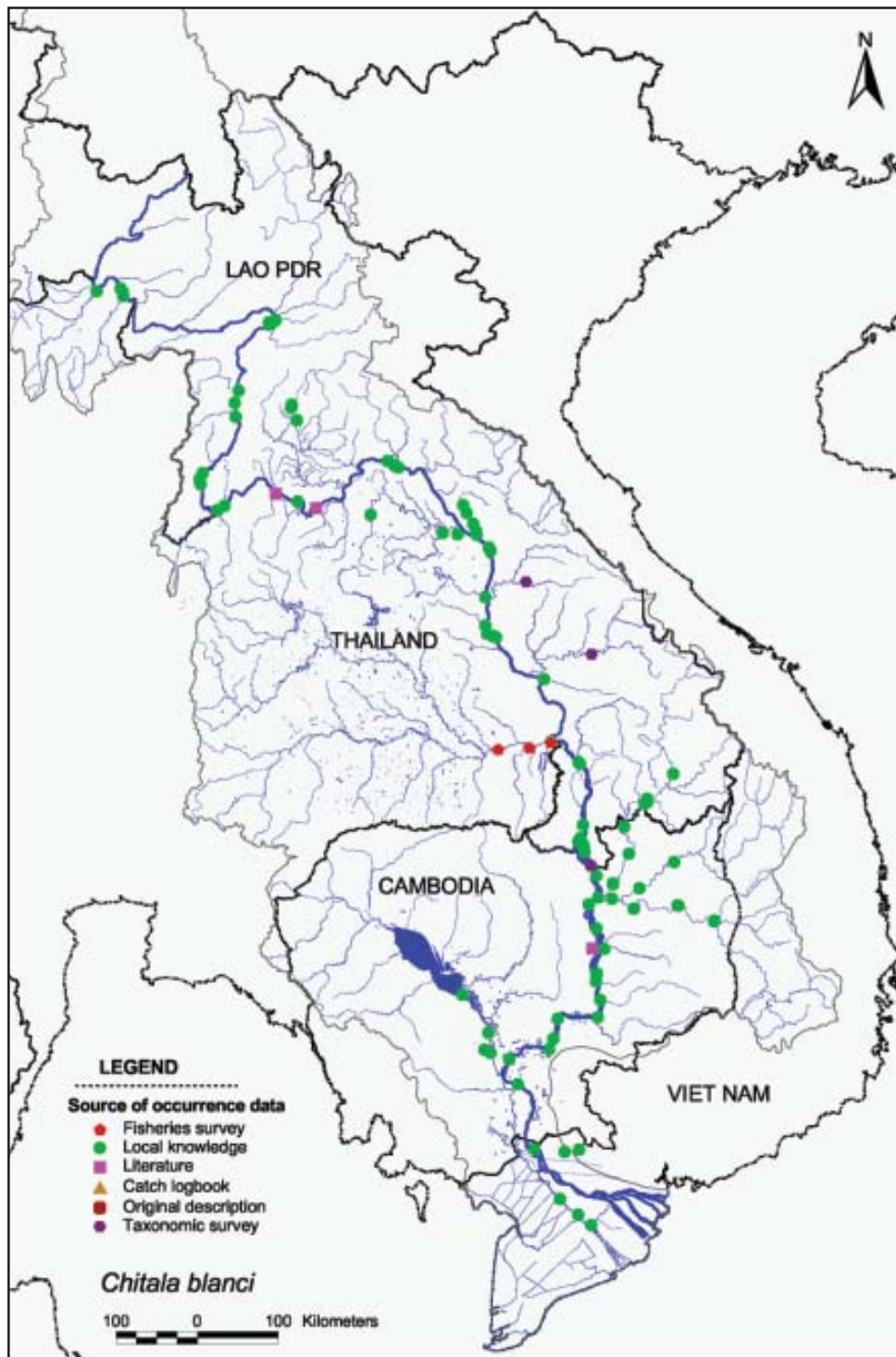
Larger fish probably spend the entire year in deep pools in the main river channel<sup>1</sup>.

### Fisheries

Large individuals are seen at local markets throughout its range. However, it is less common than its congener, *Chitala ornata*.



<sup>1,2,3,4</sup> See page 20 for information on footnotes



## *Chitala ornata* (Gray, 1831)



<b>Family:</b>	Notopteridae (Featherbacks or Knifefishes)
<b>English:</b>	Clown featherback
<b>Khmer:</b>	Trey krai
<b>Lao:</b>	Pa tong khuai
<b>Thai:</b>	Pla tong krai
<b>Vietnamese:</b>	Ca com

**World Distribution:** Widespread in mainland Southeast Asia.

**Mekong Distribution:** occurs basin-wide, having a larger distribution range than its congener *Chitala blanci*, although it depends on similar habitats in the Mekong mainstream (rapids and pools, with rocks and submerged vegetation).

**Feeding:** carnivorous – feeds mainly on fish, crustaceans and insects. It is crepuscular, a night-active “hunter”.

**Size:** up to 100 cm.

### Critical habitats

**Spawning habitats:** as with *Chitala blanci*, eggs are laid on submerged wood from March to July, with the female guarding the fry. Smith (1945) stated that after spawning, the female departs and the male guards the eggs.

**Feeding habitats:** it feeds mainly in the Mekong mainstream and in the Sesan tributary system. However, it may also enter smaller tributaries during the flood season.

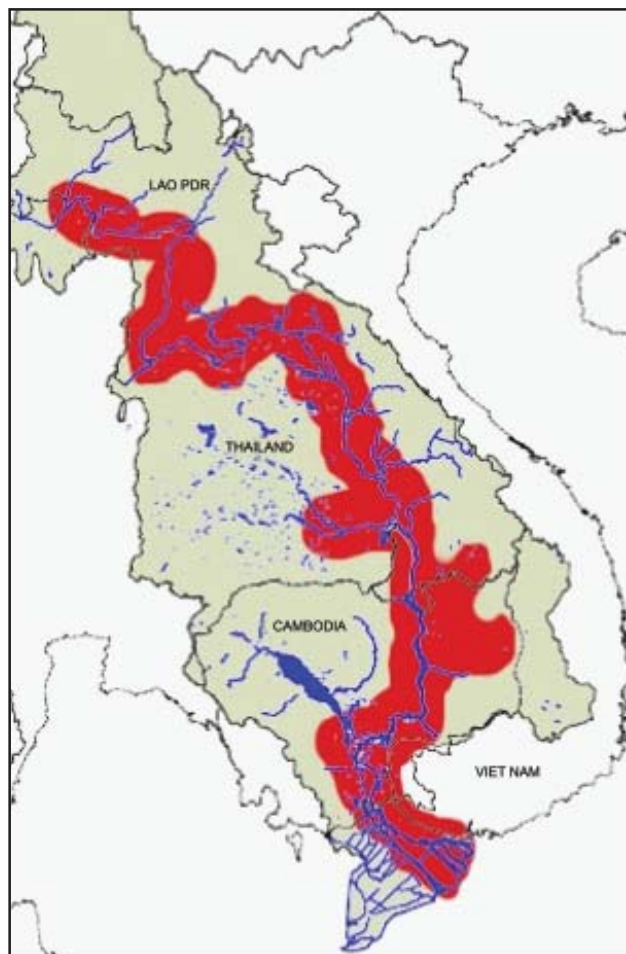
**Refuge habitats:** lives in pools within the Mekong mainstream<sup>1</sup>.

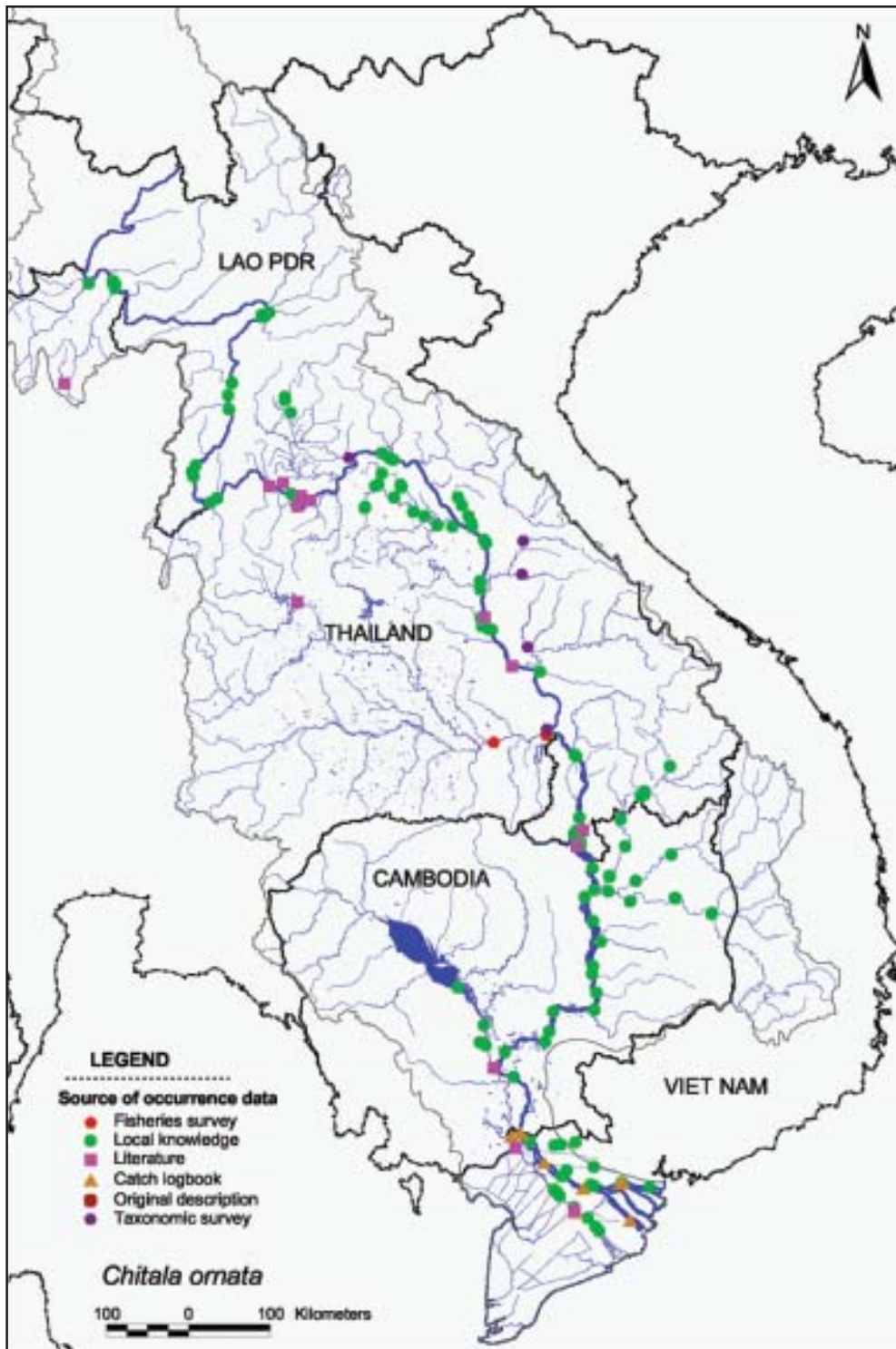
### Life Cycle

*Chitala ornata* is reported to migrate locally into smaller tributaries and flooded areas during the flood season and return to the main river channel when water levels start to recede. Several fishermen mentioned that the habits of *Chitala ornata* and *Chitala blanci* were the same within the mainstream, including spawning habits. Observations of spawning have been made in Loei, Paksan, Nakhon Phanom and Ubon Ratchatani provinces<sup>1</sup>.

### Fisheries

Large individuals are often seen at local markets throughout its range. It is more common than its congener, *Chitala blanci*. It is mainly caught by gillnets and hook and line. The species also features prominently in the aquarium trade.







## *Cirrhinus microlepis* Sauvage, 1878



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Small-scale river carp
<b>Khmer:</b>	Trey pruol, Trey kralang
<b>Lao:</b>	Pa phon, pa phon mak kok
<b>Thai:</b>	Pla nuan chan, pla pon
<b>Vietnamese:</b>	Ca duong

**World Distribution:** Mekong, and Chao Phraya System, Thailand.

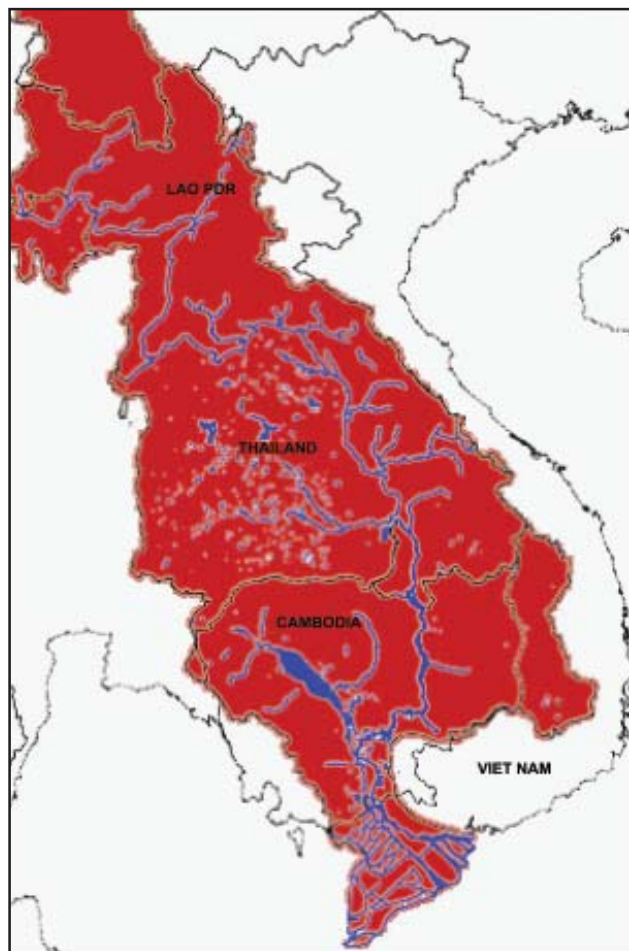
**Mekong Distribution:** occurs throughout the lower Mekong basin<sup>1,2,3</sup>.

**Feeding:** omnivorous – feeds mainly on phytoplankton, detritus, filamentous algae and plant fragments, zooplankton and insects.

**Size:** up to 65 cm.

### Population structure

There are at least two populations of *Cirrhinus microlepis*. One population from Loei to Chiang Saen undertakes upstream migrations from May to August to spawning grounds within the main river channel, where spawning occurs in June-July. The second population occurs in the stretch of the river from Boulikhamxay in the north to the Mekong delta (there may be a degree of overlap). The eggs and larvae drift downstream and out into the flooded areas. Juveniles and adults also move downstream and out into the floodplains during the flood season, particularly in southern Cambodia and Viet Nam, and up through the Tonle Sap River system. When the water begins to recede at the end of the flood season, the fish move back into rivers where they start a non-reproductive upstream dispersal migration.



### Critical Habitats

**Spawning habitats:** one spawning site has been identified in the Mekong mainstream, at the village Phatomphone, approximately 50 km downstream from Pakse town in Lao PDR. This site has supplied brood stock for an artificial breeding programme for many years (Bouakhamvongsa, personal communication). At this site, the Mekong River is wide with a sandy bottom and shallow beaches, alternating with rapids. A 2-3 kg female can produce 130,000 to 275,000 eggs. The fish is sexually mature at 17 cm.

**Feeding habitats:** the larvae and juveniles feed in floodplain habitats, particularly in the lower stretches of the basin in the Tonle Sap River/Great Lake system and the Mekong delta in Viet Nam. The sub-adults also move into flooded forest and feed on leaves.

**Refuge habitats:** during the dry season, the fish seek refuge in deep pools along the Mekong mainstream<sup>1</sup>.

<sup>1,2,3,4</sup> See page 20 for information on footnotes

## **Life Cycle**

*Cirrhinus microlepis* undertakes several seasonal migrations between feeding and refuge habitats, before it matures and is ready to migrate to its spawning grounds. After spawning, which occurs in June-July, eggs and larvae drift downstream to their nursery habitats on the extensive floodplains of the lower Mekong basin<sup>4</sup>. At the beginning of the dry season, the young fish move out of the floodplains, back into the Mekong where they initiate large-scale upstream migrations towards their dry season refuge habitats.

When the next flood season arrives, the immature fish moves back into floodplain habitats, whereas the mature adults migrate to their spawning site where they spawn.

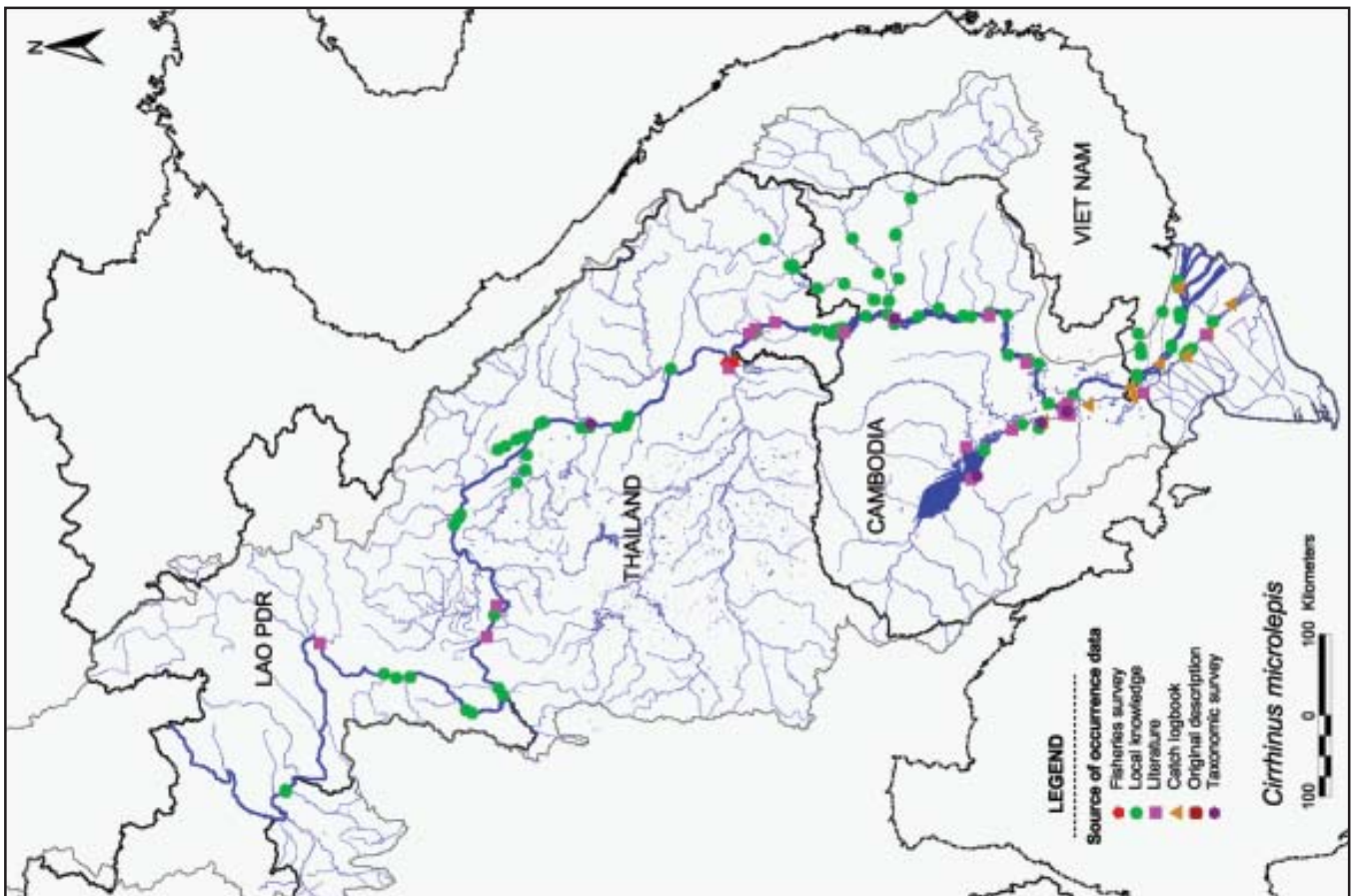
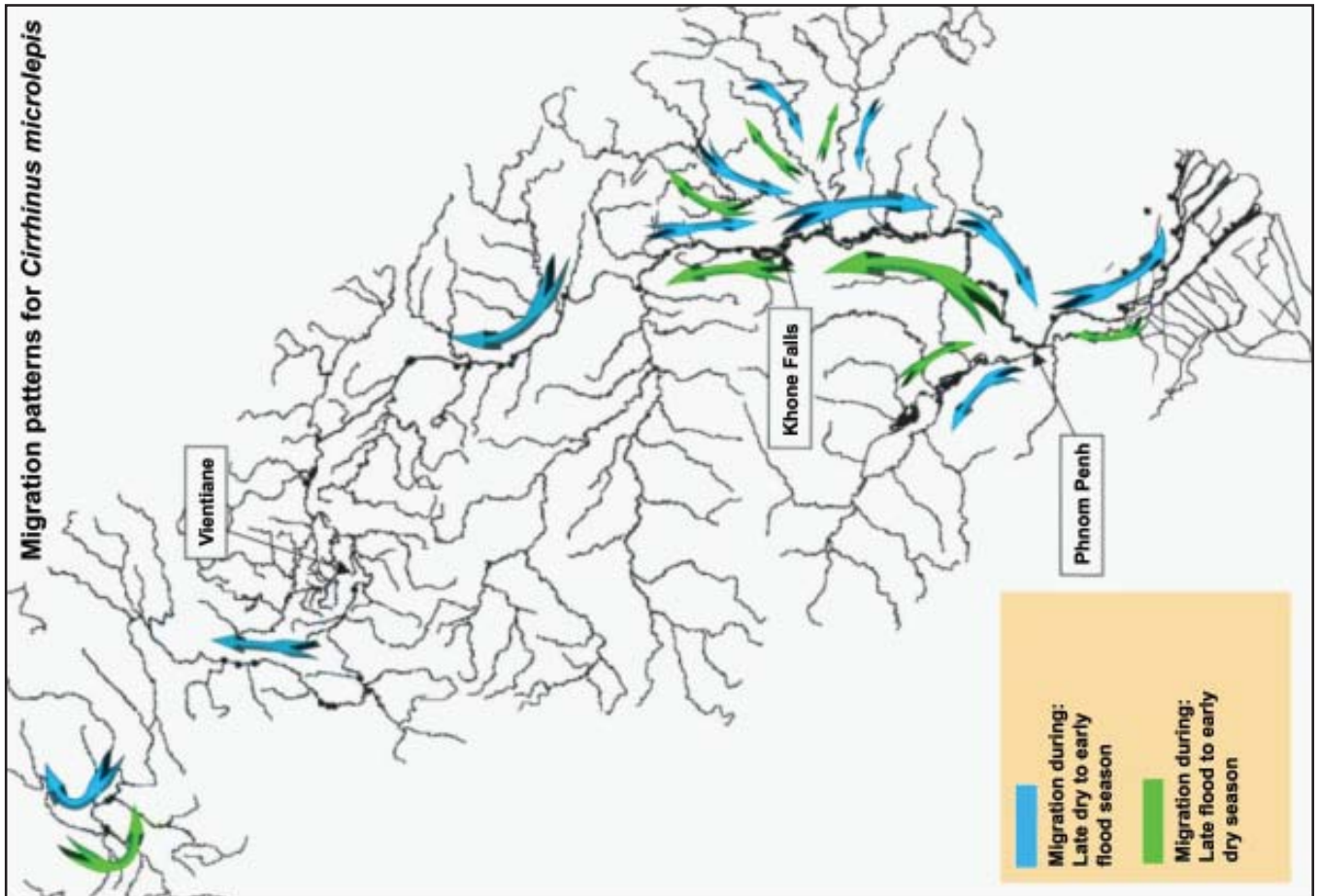
In the Mekong delta, only downstream migrations were reported, comprising mainly juveniles sized between 2 and 20 cm.

The migration pattern above the Khone Falls is less clear. From Klong Kaem district, Ubon Ratchatani, *Cirrhinus microlepis* migrate upstream in February, while further upstream in Ubon Ratchatani, at Khemmaratch, they migrate upstream during March-April and during May at Mukdahan. During June-July however, they migrate downstream at Klong Kaem. During that period, fish in reproductive condition are reported. At Loei, the species is found throughout the year. From Xayaboury to Chiang Saen, upstream migrations occur from March to August. Again, there appear to be two distinct migrations, one of sub-adults (ranging from 15 to 50 cm) during March and April, and a second migration during June and July that comprises large *Cirrhinus microlepis* within the range of 40 to 90 cm. The latter movement appears to be a spawning migration as mature fish bearing eggs were reported during July-August.

## **Fisheries**

*Cirrhinus microlepis* is one of the most important fish for the local fisheries during the dry season from January to March, when it migrates upstream (Warren *et al.*, 1998; Baird, 1998). From December to February it is also an important species for the *dai* fisheries in the Tonle Sap River as it migrates downstream (Lieng *et al.* 1995). Juveniles are mainly caught in these two fisheries.

Large adults are caught sporadically in the middle Mekong, mainly by gillnets.



## *Cirrhinus siamensis* (Sauvage, 1881) and *C. lobatus* (Smith, 1945)



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Siamese mud carp
<b>Khmer:</b>	Riel tob <i>and</i> Riel ongkarm
<b>Lao:</b>	Pa soi hua lam <i>and</i> Pa soi hua po
<b>Thai:</b>	Pla soi klorn <i>and</i> Pla soi khao
<b>Vietnamese:</b>	Ca linh thuy <i>and</i> Ca linh ong

These two species were formerly classified in the genus *Henicorhynchus*, which is now treated as a junior synonym of *Cirrhinus* (Roberts, 1997). Many records of *Cirrhinus jullieni* (a larger and less common species) probably refer to *C. siamensis* (Roberts, 1997). Other small *Cirrhinus* spp. or similar cyprinids are often combined with these species in catches, so conclusions about biology based on fishers' reports or catch monitoring are somewhat tentative at present.

**World Distribution:** *C. lobatus* is endemic to the Mekong. *C. siamensis* is found also in the Chao Phraya System.

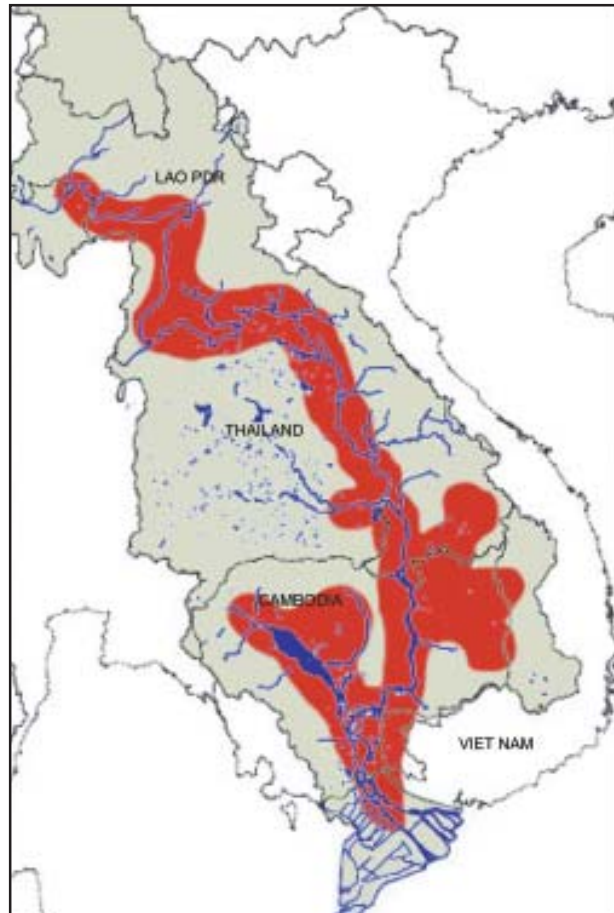
**Mekong Distribution:** These two small species occur from the Mekong delta all along the Mekong River and tributaries to Chiang Khong, near the border between the Lao PDR, Thailand and Myanmar. They are very similar to each other, so they are not usually separated by fishers; there may be differing proportions of each species in different places.

**Feeding:** herbivorous – mainly algae, periphyton, phytoplankton.

**Size:** up to 15 cm. and 20 cm for *C. lobatus* and *C. siamensis* respectively.

### Population structure

These small *Cirrhinus* species may have many overlapping populations, some of which are long-distance migratory fishes and others which only migrate short distances. Separated populations persist in some river reaches in Thailand between barriers on rivers. Thus, the population structure is likely to be very complex, and combined genetic and morphological research is needed to gain insight into this issue. However, existing data provide strong indications that some of the most important migratory populations of this species group in the southern part of the basin cover large geographical areas, i.e. approximately from Pakse in the north to the Mekong delta in the south (including the Tonle Sap system).



### Critical habitats

**Spawning habitats:** different populations may have different spawning habits. Some are reported to spawn on floodplains, whereas others spawn in mid-water in river channels. For instance, *Cirrhinus siamensis* has been reported to spawn in mid-water of the Mekong and some of the large tributaries<sup>1</sup>. It thus has few

specific requirements for spawning habitat, except perhaps for depth. Larvae are carried to nursery habitats on the floodplain by the water-flow.

*Feeding habitats:* this group feeds mainly on floodplain habitats, e.g. in southern Cambodia, the Tonle Sap system and the Mekong delta in Viet Nam, as well as on floodplains associated with major tributaries in the middle and upper part of the basin.

*Refuge habitats:* during the dry season, *Cirrhinus* seeks refuge in deep pools of the mainstream<sup>1</sup> and large tributaries (e.g. the Sesan/Srepok/Sekong sub-catchment<sup>1,2</sup>).

### **Life Cycle**

The two species *Cirrhinus lobatus* and *Cirrhinus siamensis* may be the most abundant fish in the middle and lower Mekong (Roberts, 1997) and can be regarded as ecological keystone species (Roberts and Baird, 1995; Roberts, 1997).

These are short-lived species that are particularly well adapted to cope with natural intra- and inter-annual environmental variability of the Mekong River. Spawning takes place at the beginning of the flood season and eggs and larvae move with the water current to their nursing habitats on the emerging floodplains<sup>4</sup>. Here, they spend the flood season feeding and growing prolifically. At the beginning of the dry season, they move out of the floodplains with the receding water and back into river channels. Eventually, their migration takes them to the Mekong, where they initiate their migration to dry season refuge habitats in deep pools throughout the basin. At the beginning of the next flood season, they are mature and ready to spawn.

These fishes are probably also the most important species in the annual dry season migrations in the lower part of the basin. These migrations take them from their floodplain habitats in the Tonle Sap / Great Lake system, through the Tonle Sap River and up the Mekong beyond the Khone Falls. Large numbers also enter the Sesan system. These migrations are under a strong lunar influence. The Tonle Sap migrations thus only occur in a short period of about 5 days around the full moon period.

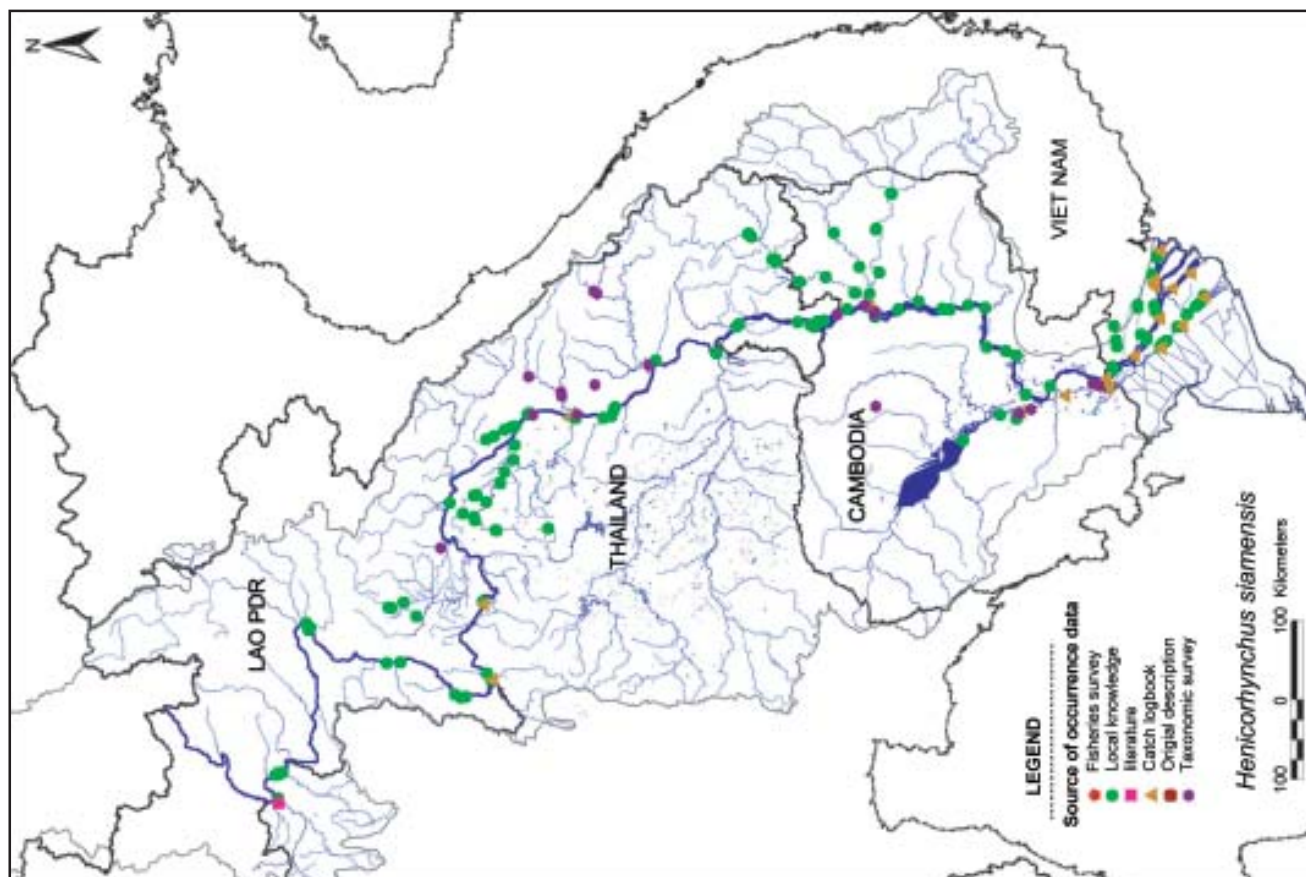
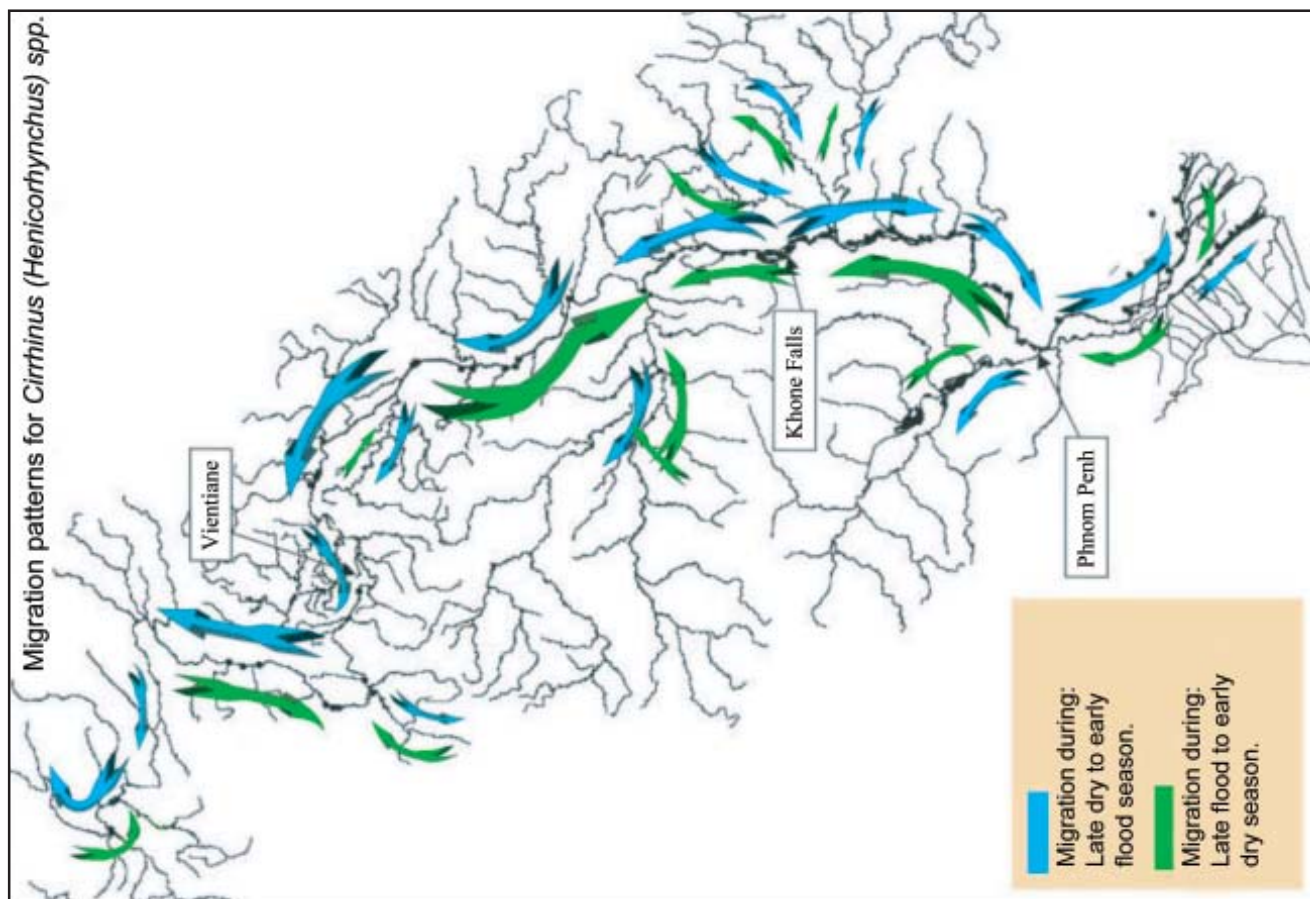
In the Sesan tributary system (including Sekong and Srepok rivers), the migrations have been documented at least as far as Tat Muong in Sekong River, Ban Phang in Sesan River and Ou Leav in Srepok River<sup>1</sup>.

### **Fisheries**

These two species are probably the most abundant in fisheries of the lower Mekong basin. For example, in the *dai* fisheries of the Tonle Sap River, they currently comprise about 50% of the catch from November to February (MRC monitoring data). Throughout their migration routes they are caught in huge numbers during their peak migration period between October and February. They thus play a crucial role for the livelihood of local communities and are the foundation for a number of processing activities such as drying and smoking and the production of fish sauce (Prahoc in Khmer or Padaek in Lao), fish paste and animal feed.

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<sup>1,2,3,4</sup> See page 20 for information on footnotes



## *Cyclocheilichthys enoplos* (Bleeker, 1850)



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Soldier river barb
<b>Khmer:</b>	Trey chhkok
<b>Lao:</b>	Pa chok, Pa choc hua lium
<b>Thai:</b>	Pla choke, Pla ta koke
<b>Vietnamese:</b>	Ca coc

**World Distribution:** widespread in Southeast Asia, including Malaysia and western Indonesia.

**Mekong Distribution:** occurs basin-wide in the Mekong mainstream but also enters large tributaries such as the Sesan River system and the Songkhram River<sup>1,3</sup>.

**Feeding:** omnivorous – feeds on a variety of food items including: snails, algae, earthworms, detritus, insect larvae, crustaceans, bivalves and even fish. The young feed mainly on zooplankton.

**Size:** up to 74 cm.

### Population structure

In the lower section of the basin there is probably a single population, as juveniles are mainly encountered downstream (e.g. in *dai* fisheries of the Tonle Sap) whereas mature adults are only seen upstream (e.g. migrating over the Khone Falls). A second population is distributed further upstream from Vientiane to Chiang Saen.

### Critical habitats

**Spawning habitats:** *Cyclocheilichthys enoplos* spawns in the pelagic zone of the Mekong River and its eggs and larvae are pelagic, drifting larvae being taken to their nursery habitats by the water flow.

**Feeding habitats:** the young spend their first months feeding in floodplain habitats, e.g. the Tonle Sap system and the Mekong Delta. Larger fish may stay in river channels feeding on a variety of food items, such as algae, crustaceans, molluscs and fish.

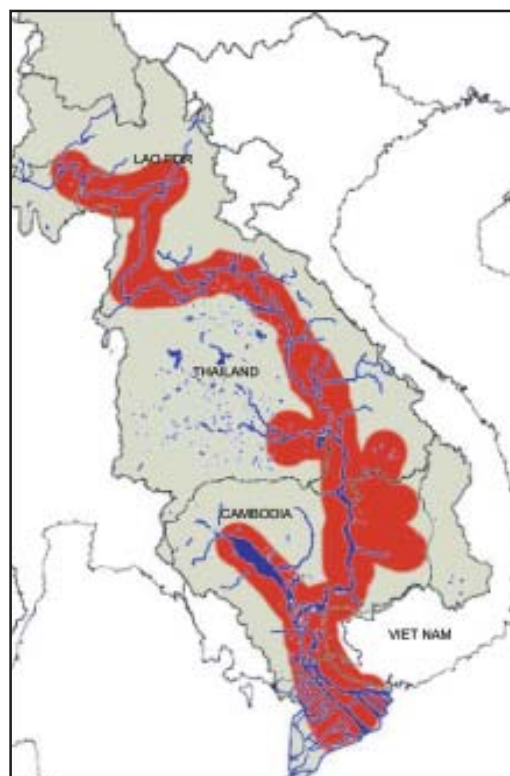
**Refuge habitats:** larger fish spend the dry season in deep pools in the river channels, e.g. between Kratie and Stung Treng (Cambodia) and at Xayaboury (Lao PDR)<sup>1</sup>. Smaller fish occur near the riverbank, in particular around flooded/submerged shrubs<sup>1</sup>.

### Life Cycle

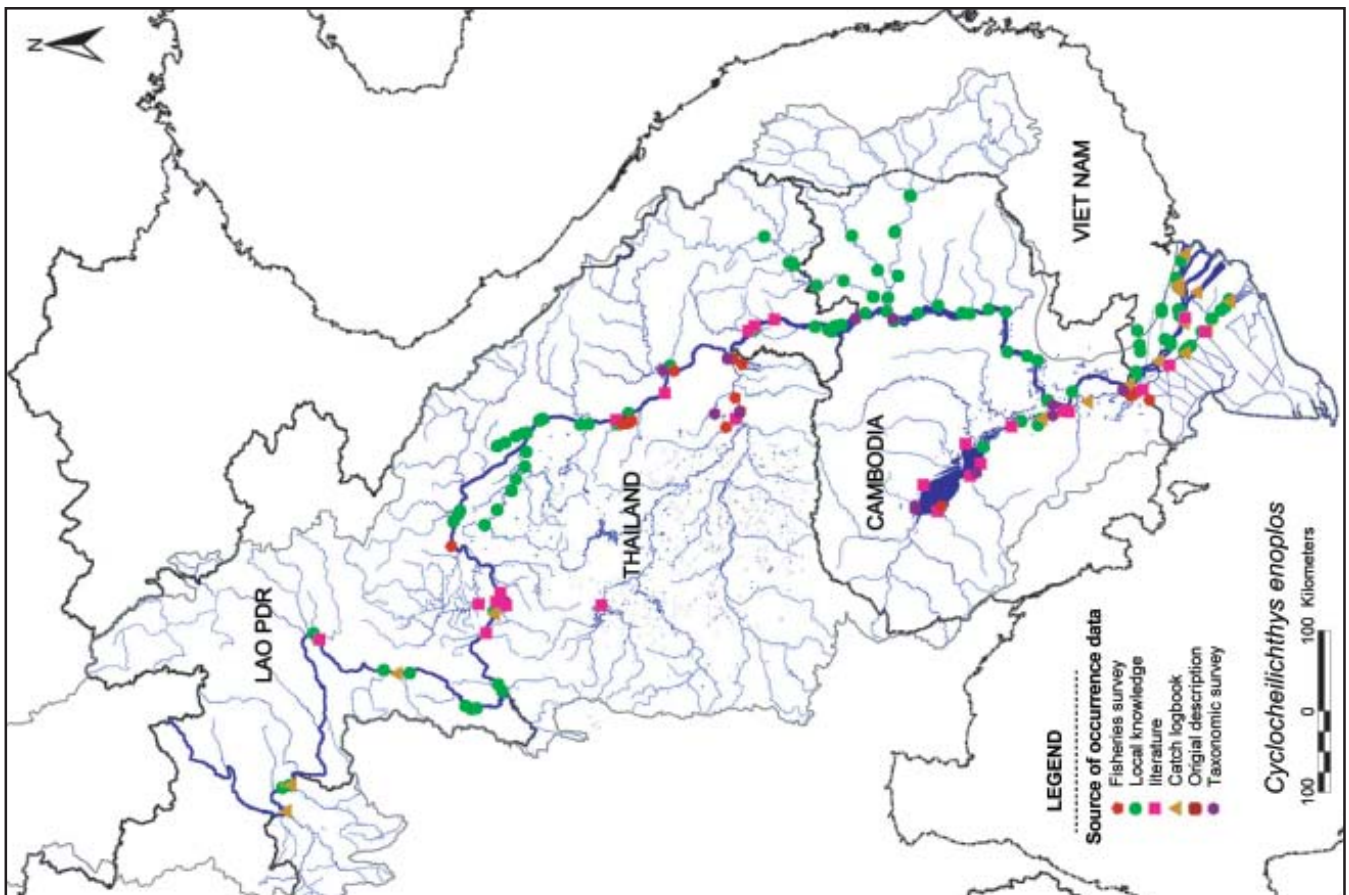
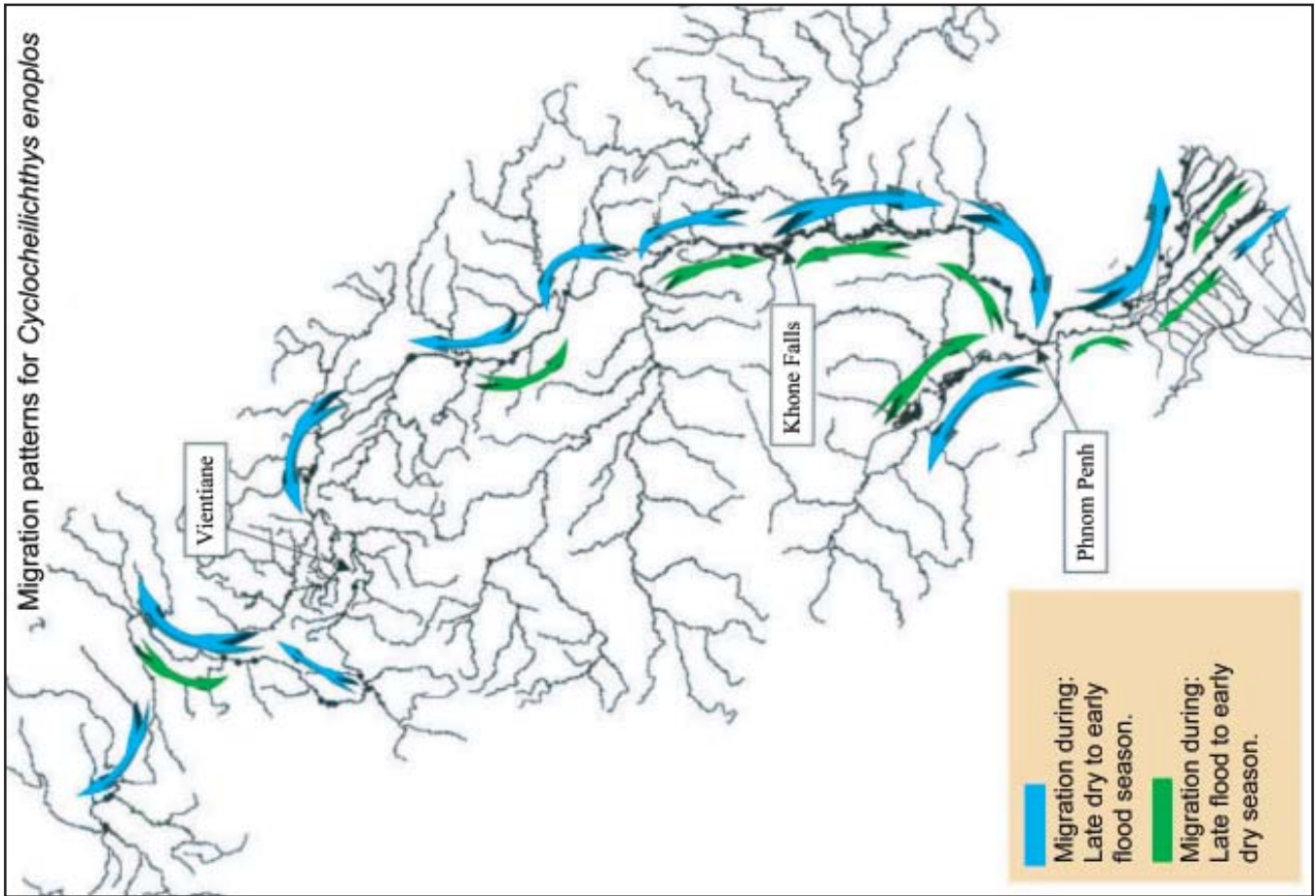
*Cyclocheilichthys enoplos* spawns during the early flood season in the Mekong mainstream<sup>4</sup>. Juveniles and adults move out into the flood plains during the flood season. When the water begins to recede at the end of the flood season, the fish migrate back into rivers where they begin their spectacular upstream dispersal migrations towards deep pools to spend the dry season. When the next monsoon sets in, mature adults migrate upstream to spawn, thereby closing the life cycle. It is not known exactly how long it takes for the fish to mature, but it is expected to be several years.

### Fisheries

*C. enoplos* is an important part of the catch in the *dai* fishery of the Tonle Sap River between December and February (Lieng et al. 1995). Larger fish are important in the Khone falls fishery in southern Lao, and it is important in fisheries at many other localities.



<sup>1,2,3,4</sup> See page 20 for information on footnotes





## *Hampala dispar* Smith, 1934



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Eye-spot barb
<b>Khmer:</b>	Trey khmann
<b>Lao:</b>	Pa sood
<b>Thai:</b>	Pla kra sube jud, Pla sood
<b>Vietnamese:</b>	Ca ngua xam

**World Distribution:** endemic to the Mekong basin.

**Mekong Distribution:** occurs basin-wide<sup>1</sup>. It occurs mainly in tributaries but often moves to the Mekong mainstream during the dry season.

**Feeding:** carnivorous – feeds mainly on crustaceans, insect larvae and fish.

**Size:** up to 35 cm.

### Population structure

Multiple, localised populations occur throughout its distribution range. Many are now fragmented by dams, yet are self-sustaining.

### Critical habitats

*Spawning habitats:* spawns throughout the flood season, possibly in or near floodplain habitats. *H. dispar* is also able to spawn in reservoirs such as the Nam Ngum Reservoir in Lao PDR, which home to large populations of the species.

*Feeding habitats:* both juveniles and large fish move into floodplain habitats during the flood season to feed. They can also adjust to living in impoundments, such as large reservoirs (see above).

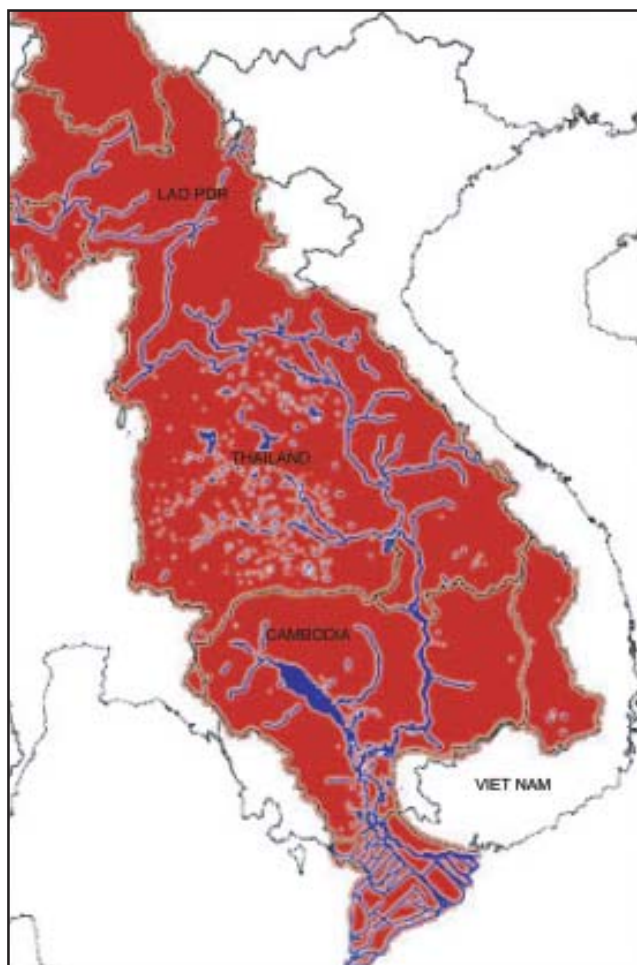
*Refuge habitats:* lives in deep pools of the Mekong mainstream during the dry season<sup>1</sup>. Reservoir populations spend the entire year there.

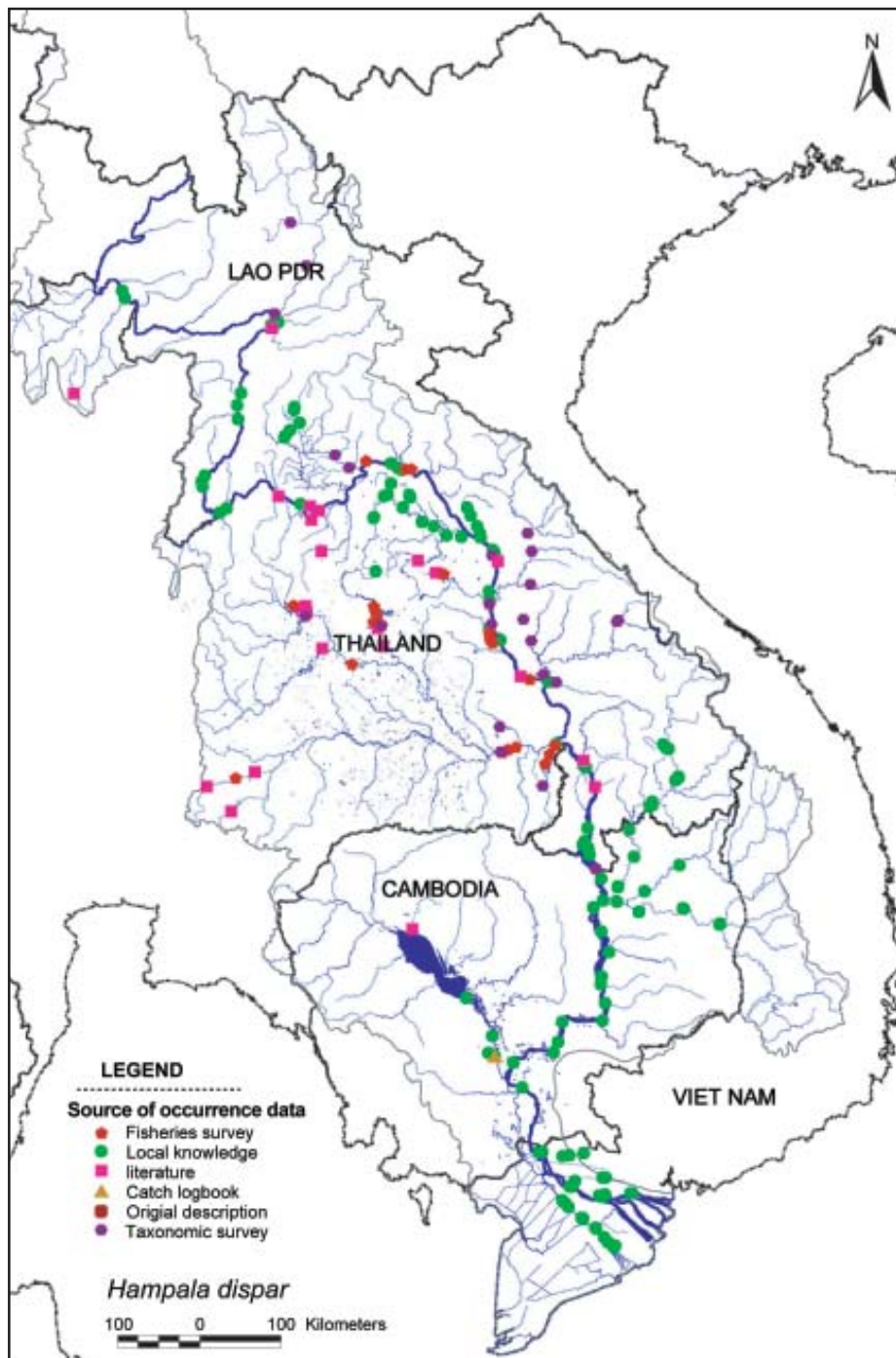
### Life Cycle

After spawning in the flood season, the larvae and juveniles enter floodplain habitats where they feed until water begins to recede at the end of the flood season. They then move back to the river channels and eventually move into deep pool habitats in the Mekong mainstream<sup>1</sup> and probably other large rivers of the basin. They appear to have an extended spawning season starting in the late dry season in March, and lasting until June. Eggs are attached to submerged wood, and larvae and juveniles remain around habitats containing submerged vegetation along the riverbank.

### Fisheries

Important in fisheries throughout its distribution range





## *Hampala macrolepidota* (Valenciennes, 1842)



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Barred barb
<b>Khmer:</b>	Trey khmann
<b>Lao:</b>	Pa sood
<b>Thai:</b>	Pla kra suub kheed
<b>Vietnamese:</b>	Ca ngua

**World Distribution:** widespread through Southeast Asia, including the Thailand and south through the Malay Peninsula, to western Indonesia.

**Mekong Distribution:** occurs basin-wide<sup>1</sup>. It is more common than *Hampala dispar* in the lower part of the basin, but less common in the Middle Mekong.

**Feeding:** omnivorous – but large adults (above 20 cm) feed mainly on fishes. Smaller fish feed on crustaceans, insect larvae and detritus.

**Size:** up to 70 cm, more commonly 45 cm.

### Population structure

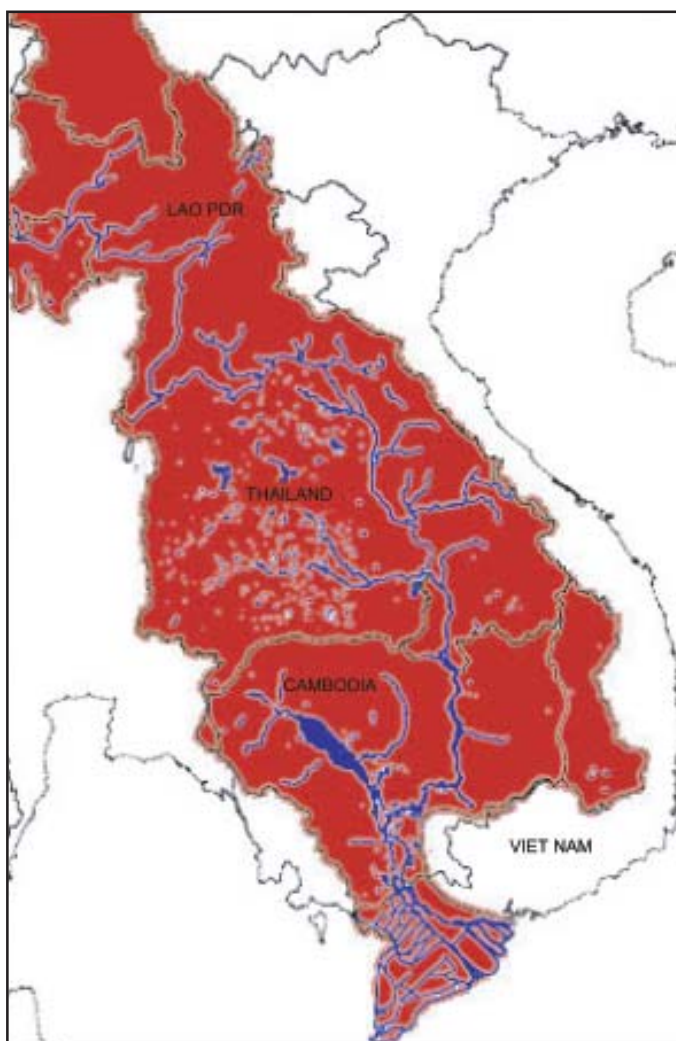
Multiple, localised populations occur throughout its distribution range. Many are now fragmented by dams, yet are self-sustaining.

### Critical habitats

*Spawning habitats:* it spawns throughout the flood season, possibly in or near floodplain habitats but also able to spawn in impoundments.

*Feeding habitats,* both juveniles and large fish move into floodplain habitats during the flood season to feed.

*Refuge habitats:* lives in deep pools of the Mekong mainstream during the dry season<sup>1</sup>. Populations in reservoirs spend the entire year in the reservoir.

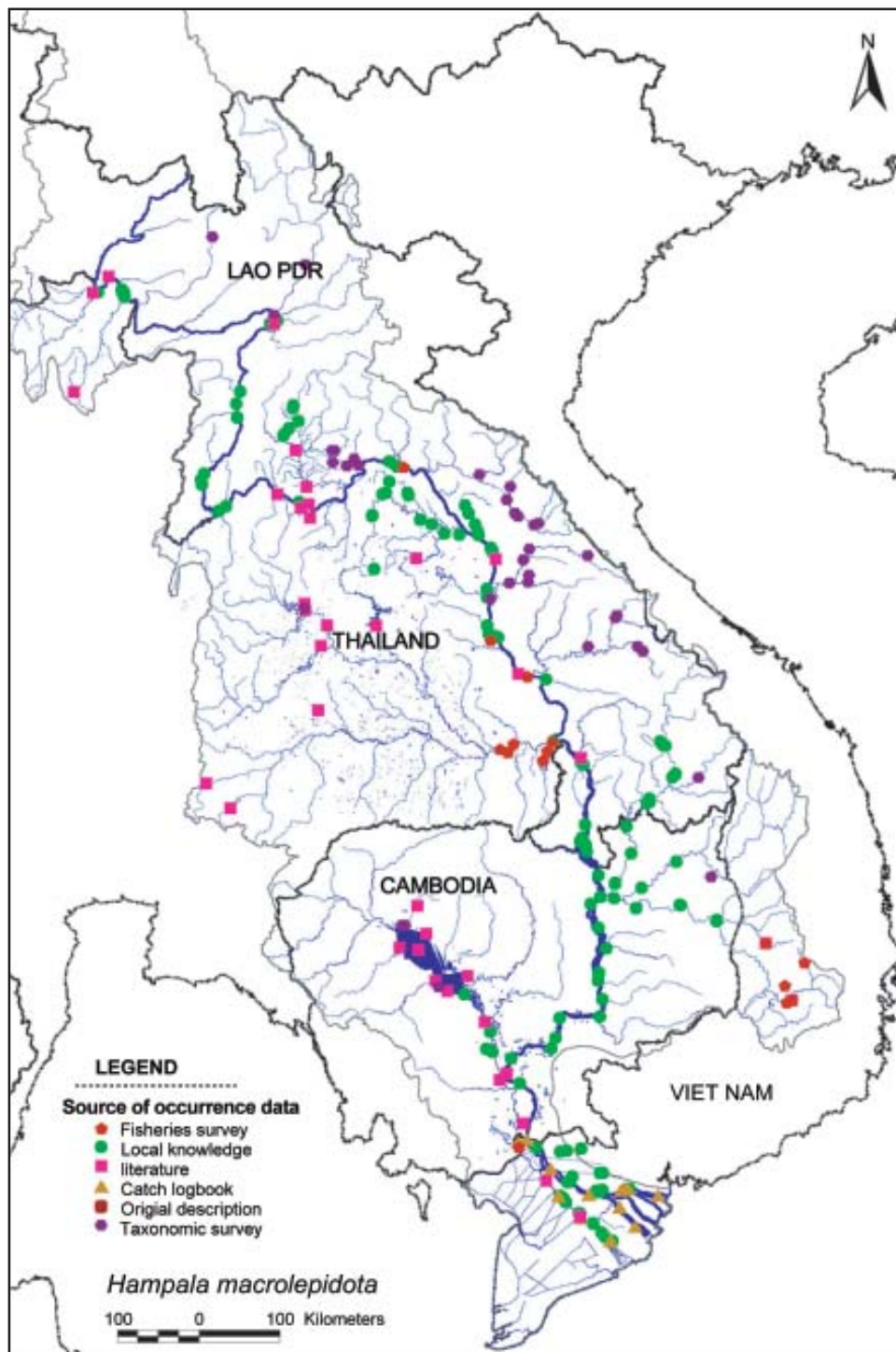


### Life Cycle

After spawning in the flood season, the larvae and juveniles enter floodplain habitats where they feed until water begins to recede at the end of the flood season. They then move back to the river channels and eventually move into deep pool habitats in the Mekong mainstream<sup>1</sup> and probably other large rivers of the basin.

### Fisheries

Important in fisheries throughout its distribution range.



## *Helicophagus waandersii* Bleeker, 1858



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Catfish
<b>Khmer:</b>	Trey pra kandor
<b>Lao:</b>	Pa na nu; Pa nu; Pa hoi
<b>Thai:</b>	Pla yon nhu
<b>Vietnamese:</b>	Ca tra chuet

**World Distribution:** Southeast Asia, Mekong and Chao Phraya, south to Sumatra.

**Mekong Distribution:** occurs throughout the lower Mekong basin. The species is particularly common along the middle Mekong (from the Khone Falls and upstream to Loei River) and less common in the lower section (below the Khone Falls). Found in large rivers (Rainboth 1996). It also enters large tributaries such as the Songkhram River and the Sesan/Srepok/Sekong sub-catchment<sup>1,2</sup>.

**Feeding:** feeds almost exclusively on bivalve molluscs.

**Size:** up to 79 cm.

### Population structure

*Helicophagus waandersii* probably consists of several distinct populations throughout its distribution range. Some populations may be associated with a particular tributary system (e.g. Songkhram River<sup>1</sup>, Nam Ngum River<sup>1</sup>) using the Mekong River as a dry season refuge.

### Critical habitats

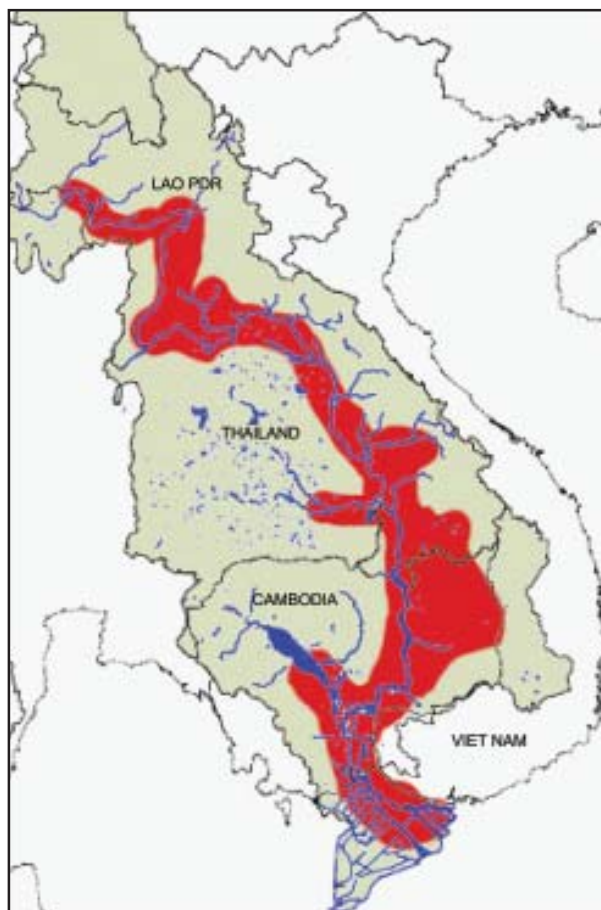
**Spawning habitats:** *H. waandersii* spawns in large rivers, both in the Mekong mainstream and possibly also in some of the major tributaries.

**Feeding habitats:** adults feed on molluscs in the mainstream and large tributaries. Specific feeding requirements for the young are less known, but they are also believed to remain in the river habitat and do not depend on floodplains, as opposed to most other species of the pangasiid family.

**Refuge habitats:** adults of the species spend most of the year in dry season refuges associated with deep pools in the Mekong mainstream<sup>1</sup>.

### Life Cycle

Spawning occurs at the beginning of the flood season (May-June), in the Mekong mainstream and possibly some of the major tributaries. After spawning, the larvae drift downstream to their nursery habitats. At the beginning of the dry season the young fish distribute themselves in deep pools. It is not known how many years it takes for the fish to become sexually mature. *H. waandersii* is the first of the pangasiid species to migrate upstream each year. Already in March to May, at the peak of the dry season, the first “pulse” of



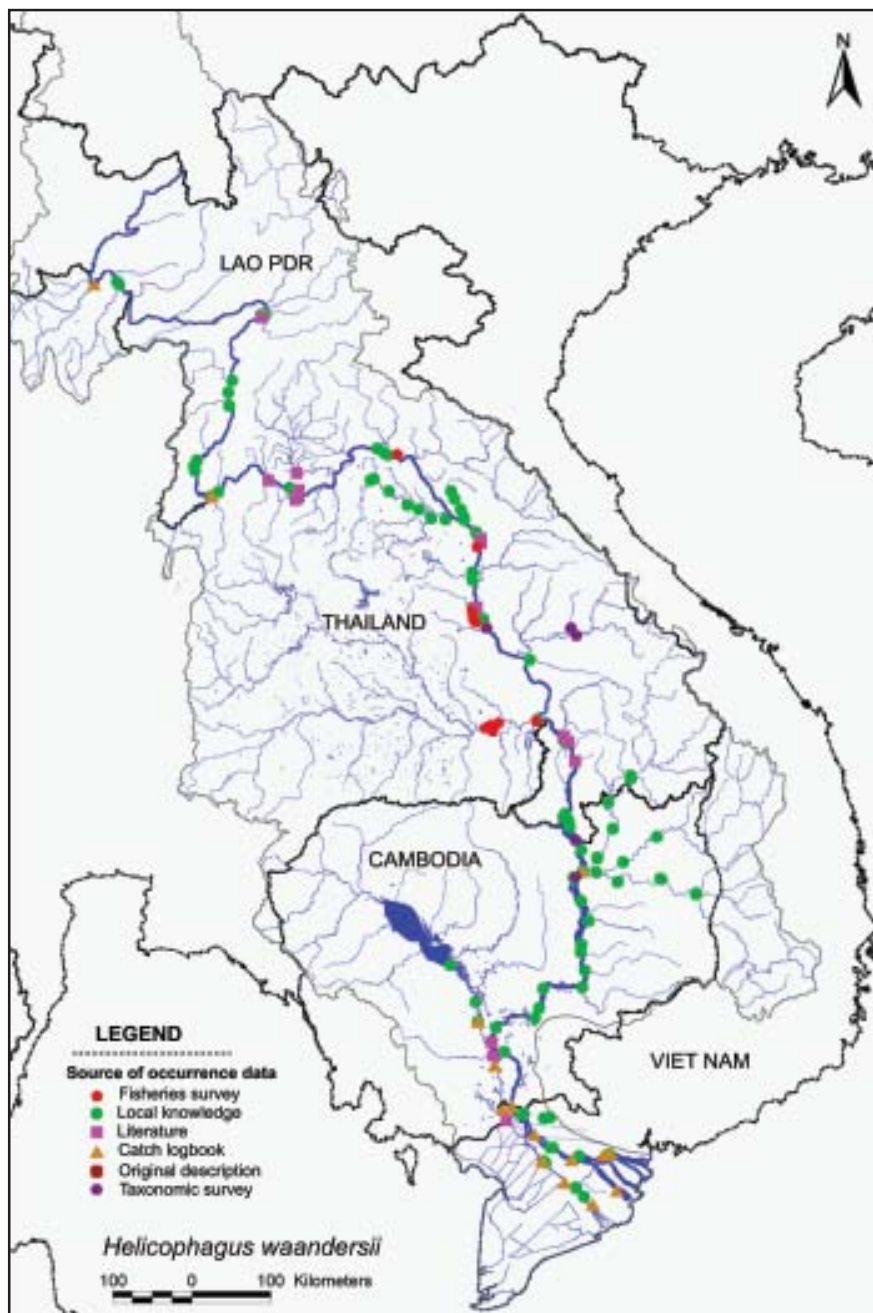
<sup>1,2,3,4</sup> See page 20 for information on footnotes

migrating *Helicophagus* occurs particularly along the stretch from the Khone Falls to northern Lao PDR and Thailand<sup>1</sup>. This is believed to constitute mainly immature fishes, possibly migrating for food or dispersal.

When the monsoon arrives in May-June, another pulse of upstream migration takes place along the same stretch. This is believed to be a spawning migration, since females with eggs are known to participate<sup>1</sup>.

### **Fisheries**

This species is particularly important in the middle Mekong<sup>2,3</sup>. During the late dry season (March to May) it is one of few fishes that is available in significant amounts and thus plays an important role during a lean time of year.



## *Hemibagrus filamentus* (Fang & Chauv, 1949)



<b>Family:</b>	Bagridae (Bagrid catfishes)
<b>English:</b>	Sutchi River Catfish
<b>Khmer:</b>	Tanel
<b>Lao:</b>	
<b>Thai:</b>	Pla kod lueng
<b>Vietnamese:</b>	Ca lang Suy

This fish is better known under its former name, *Mystus nemurus*. Kottelat (2001) shows *Hemibagrus* aff. *nemurus* as a similar but more widespread species, so it is likely that two species are included in this taxon.

**World Distribution:** Mekong, Chao Phraya and Southeast Thailand.

**Mekong Distribution:** occurs basin-wide and is a very common species.

**Feeding:** omnivorous, with carnivorous preference – feeds mainly on fishes, crustaceans, aquatic insect larvae and plant fragments.

**Size:** up to 60 cm.

### Population structure

Multiple populations exist throughout the basin, each possibly associated with a tributary.

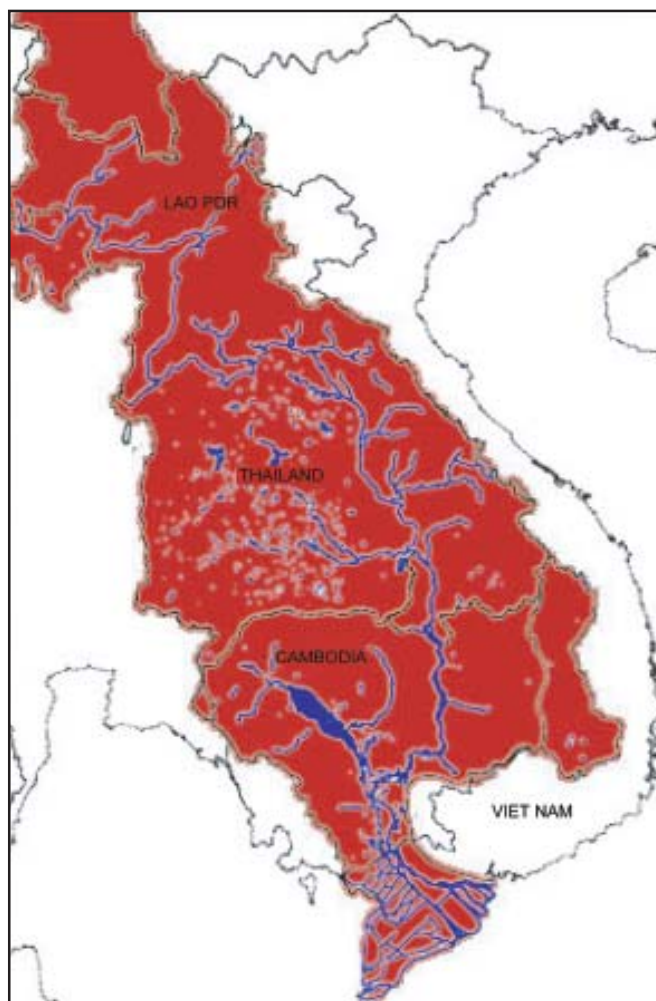
### Critical habitats

*Spawning habitats:* *H. filamentus* spawns in floodplain habitats at the beginning of the flood season (June-July). It is believed to spawn near submerged shrubs and trees<sup>1</sup>.

*Feeding habitats:* the young spend the first three-four months feeding on the floodplains.

Adults feed on fishes and invertebrates in river channels.

*Refuge habitats:* spends the dry season in deep pools along the Mekong mainstream<sup>1</sup> and its tributaries.



### Life Cycle

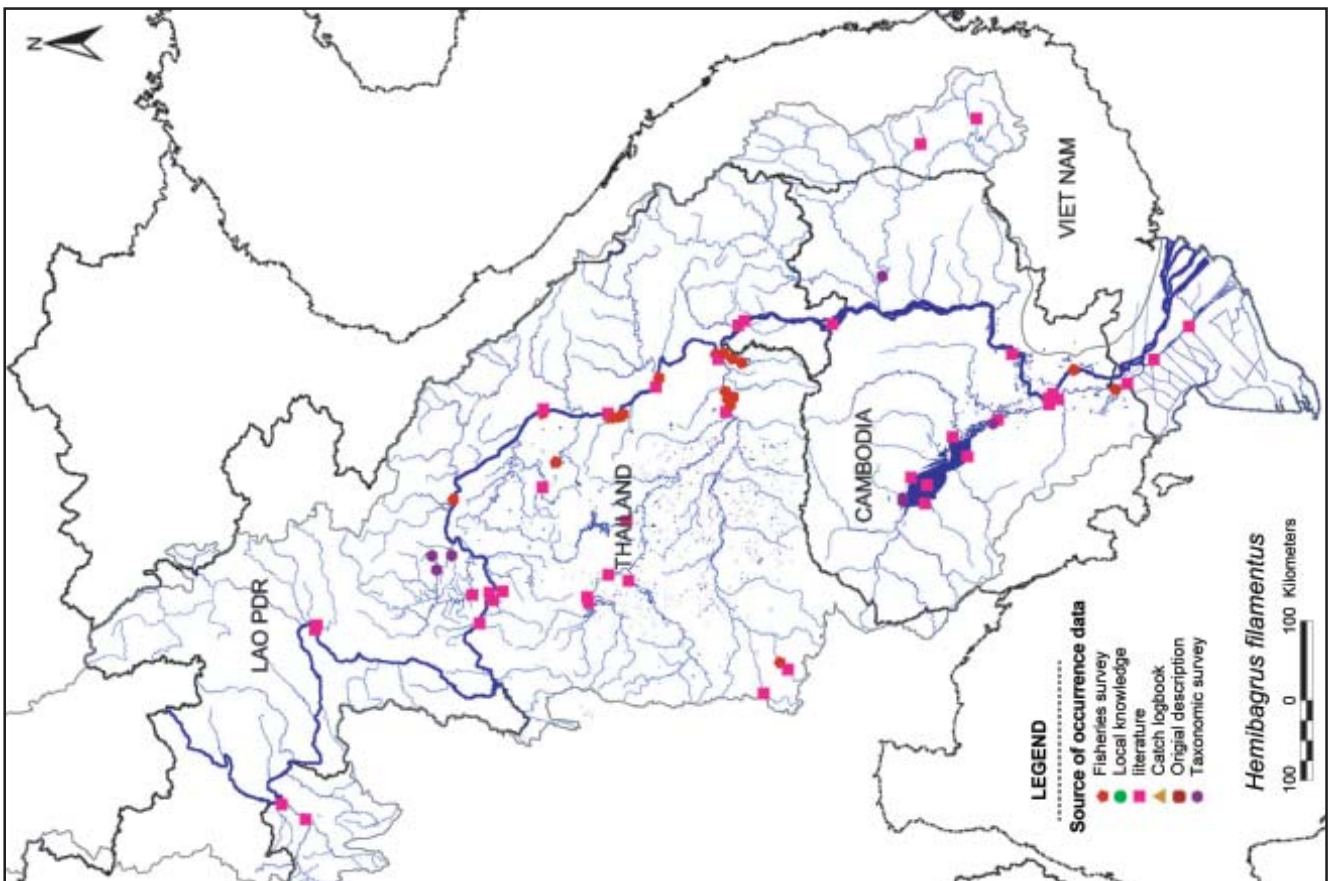
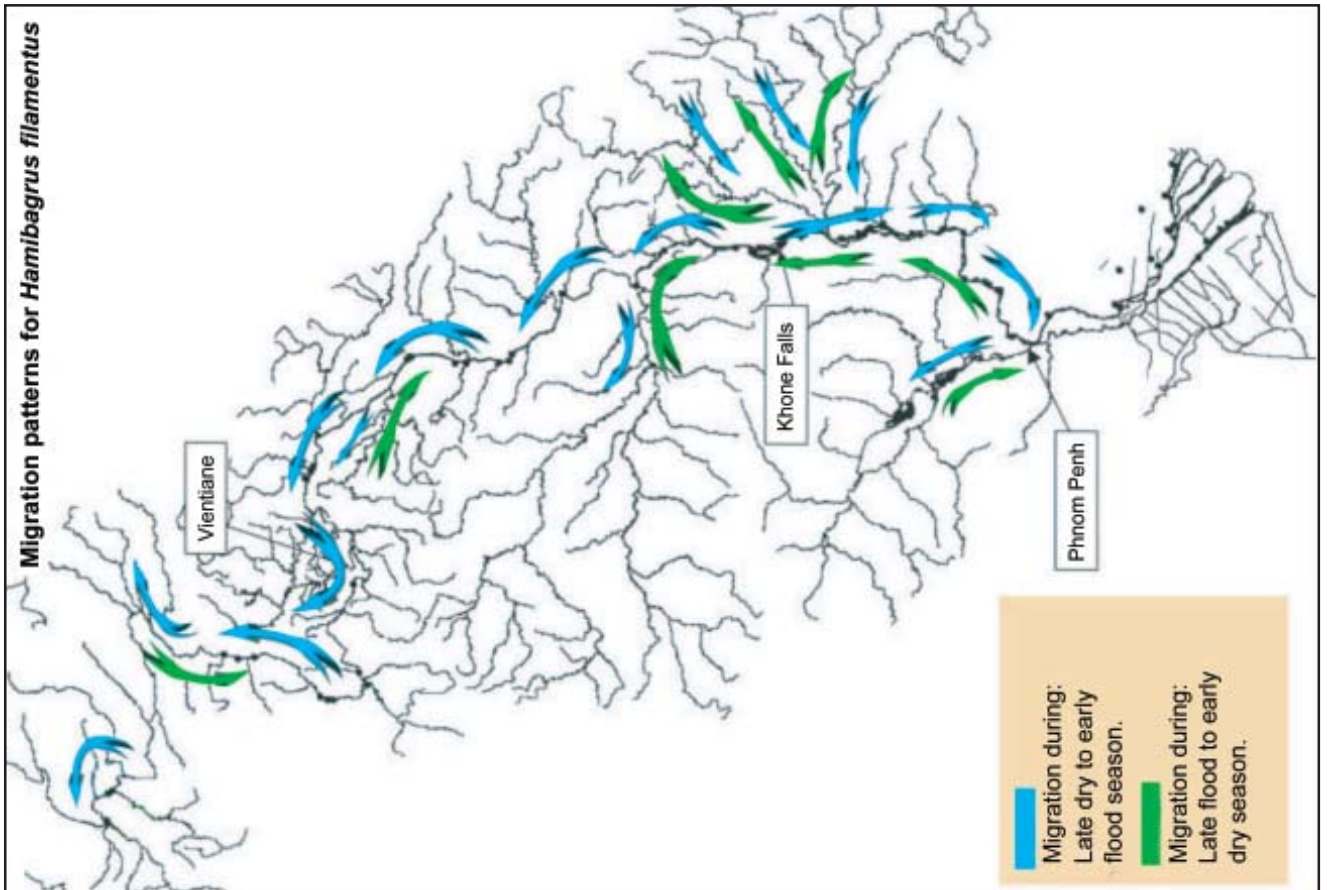
Migration into smaller tributaries and out into flooded areas occurs with the rising water level, spawning taking place during the months of June-July. When water levels start to recede at the end of the flood season the fish return to the main river channel where they remain in deep pools during the dry season. At several places throughout the basin, migrations are guided by the lunar phase: in the Mekong in Cambodia, the early dry-season upstream migrations occur just before, and during, the full moon. At Loei, migration reportedly occurs during the waning-moon phase.

## **Fisheries**

*H. filamentus* has previously been recorded in fisheries around the Khone Falls (Baird, 1998). In a gill-net fishery at Ban Hang Khone, which mainly targets small cyprinids such as *Scaphognathops* spp., *H. filamentus* ranked as tenth in terms of total weight. In the dry season, the *tone* trap fishery, which targets highly migratory cyprinids (e.g., *Henicorhynchus* spp. and *Papalauca typus*), the species was ranked 35 in terms of total biomass. *Hemibagrus filamentus* was also caught during the flood season, where it ranked twelfth and eighteenth in *chan* trap and *kha* trap fisheries, respectively (Baird, 1998).

Singanouvong et al. (1996a) reported *Hemibagrus filamentus* in gill net catches at the Khone Falls, but did not believe it to be migrating over the Khone Falls during the dry season. During the monsoon season however, the same authors listed the species as an upstream migratory species, based on catch records from the highly specialised *lee* (wing) trap fisheries right at the centre of the Khone Falls.





## *Labeo chrysophekadion* (Bleeker, 1850)



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Black sharkminnow
<b>Khmer:</b>	Trey kaek
<b>Lao:</b>	Pa phia (ki kam)
<b>Thai:</b>	Pla ka dum, Pla etuu
<b>Vietnamese:</b>	Ca et moi

**World Distribution:** Southeast Asia: Mekong and Chao Phraya Systems, Thailand to the Malay Peninsula, western Indonesia and Borneo.

**Mekong Distribution:** widespread through the entire basin.

**Feeding:** mainly herbivorous – feeds on various algae, periphyton, phytoplankton, other plant material and detritus

**Size:** up to 90 cm.

### Population structure

*Labeo chrysophekadion* is believed to consist of multiple populations, each possibly associated with a tributary and using the Mekong as dry season refuge. Self-sustaining populations are also present in reservoirs.

### Critical habitats

**Spawning habitats:** *L. chrysophekadion* is an opportunistic spawner and believed to be able to spawn in a variety of habitats, including swamps and other floodplain habitats, and in shallow areas of river channels. Spawning takes place at the beginning of the flood season.

**Feeding habitats:** feeding mainly takes place in floodplain habitats where the fish feed among submerged vegetation.

**Refuge habitats:** the large fish seek refuge in deep pools of main river channels during the dry season<sup>1</sup>.

### Life Cycle

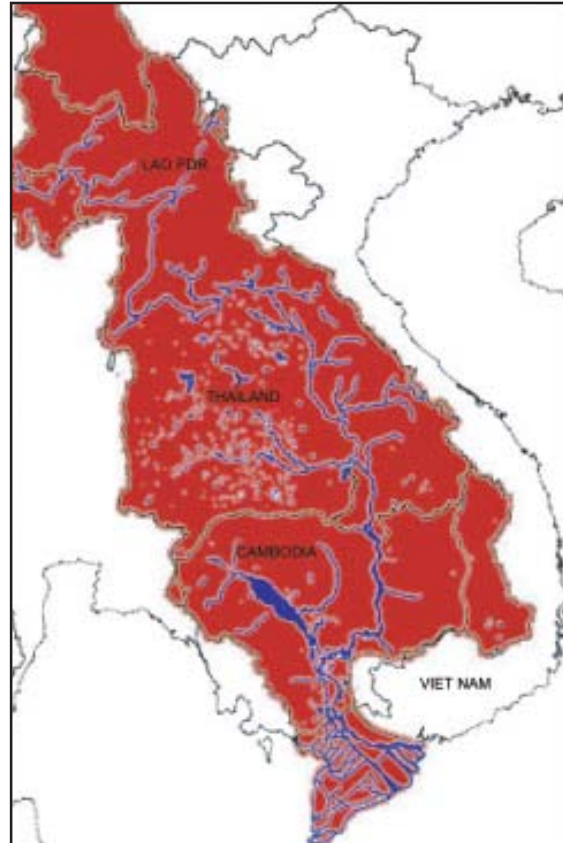
At the beginning of the monsoon season (May-June) mature fish migrate to floodplain habitats, where they spawn. The larvae and juveniles remain on the floodplain where they feed until the water recedes at the beginning of the dry season. Both adults and juveniles then move back into river channels and eventually end up in large rivers, where they migrate to their dry season habitats associated with deep pools.

In the middle Mekong, migrations towards floodplains involve upstream migrations in the Mekong, into smaller tributaries and, finally, as the water level rises, over the riverbanks into flooded areas.

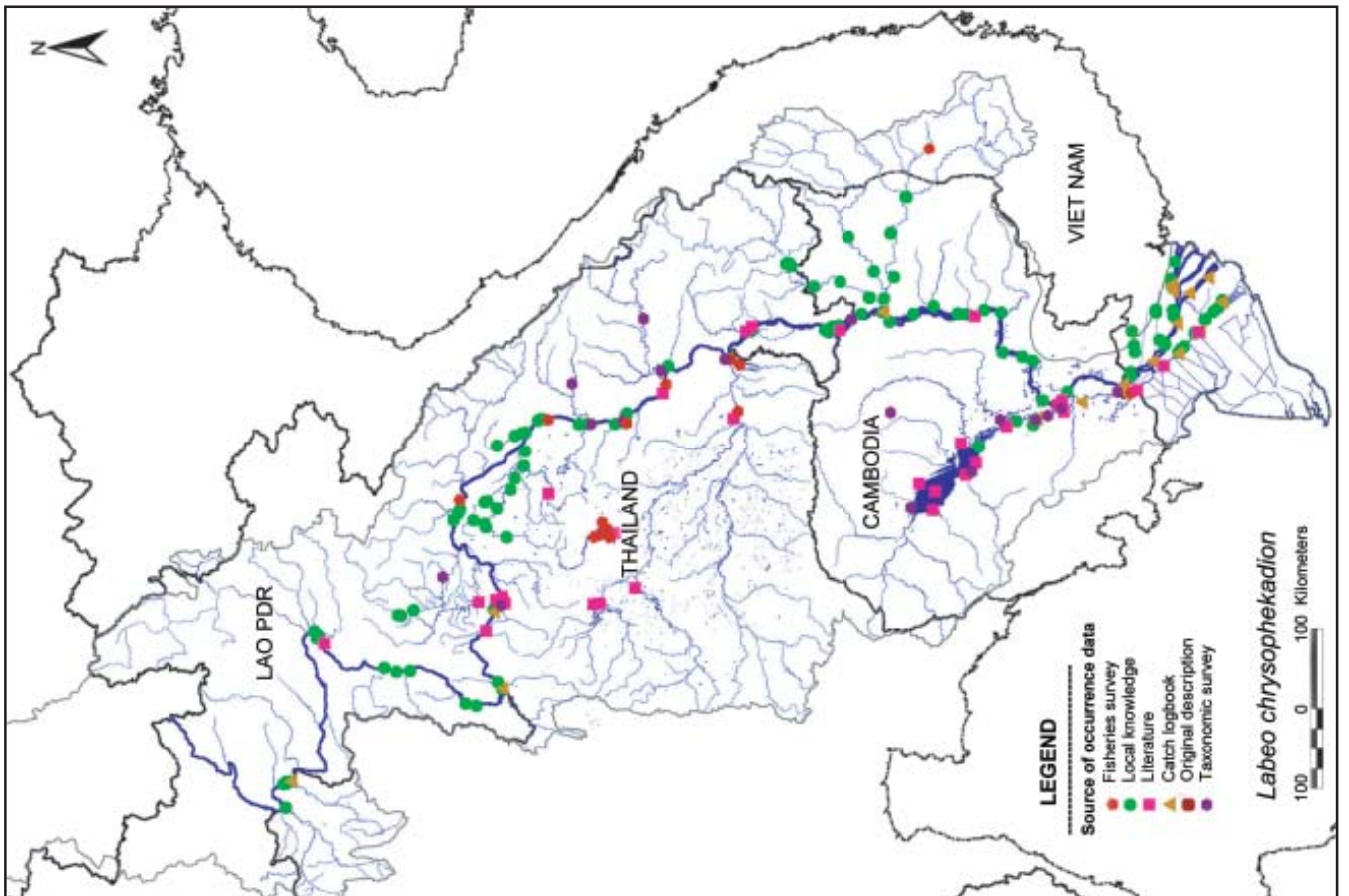
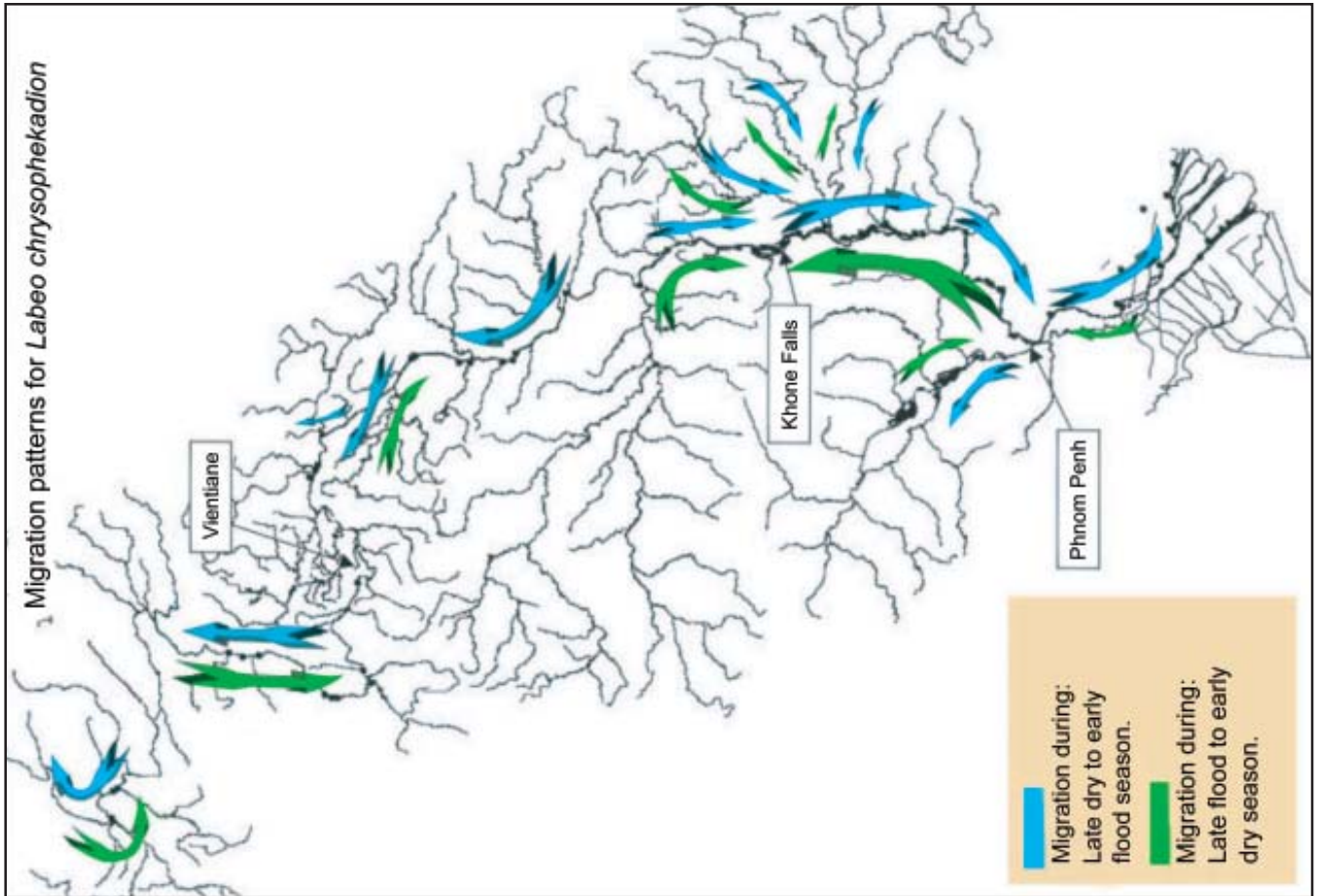
In the lower Mekong, fishes may access floodplains directly from the Mekong mainstream.

### Fisheries

*Labeo chrysophekadion* is an important and esteemed species in river fisheries throughout its range and is also caught in reservoirs. It is also important in the aquarium trade.



<sup>1,2,3,4</sup> See page 20 for information on footnotes



## *Lycothrissa crocodilus* (Bleeker, 1851)



<b>Family:</b>	Engraulidae (Anchovies)
<b>English:</b>	Sabretoothed thryssa
<b>Khmer:</b>	Chhmar Kror Poeu
<b>Lao:</b>	Pa mak chan; Pa meo
<b>Thai:</b>	Pla maew
<b>Vietnamese:</b>	Ca top

**World Distribution:** Indonchina and Southeast Asia, from Thailand to western Indonesia and Borneo.

**Mekong Distribution:** occurs from just downstream the Khone Falls to the Mekong Delta. Common in the Mekong Delta up to the Tonle Sap and in the Great Lake (Rainboth 1996), it is usually found in brackish water in the estuaries of large rivers, but often ascends into fresh water.

**Feeding:** carnivorous – feeds mainly on crustaceans, small fish and insects.

**Size:** up to 30 cm.

### Critical habitats

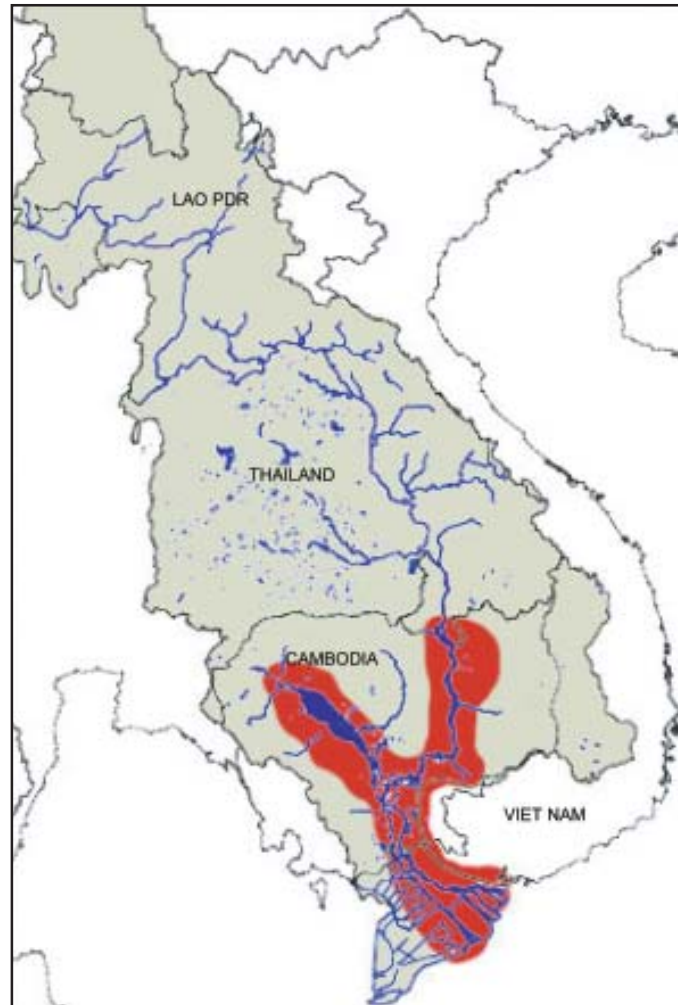
Predominantly found in estuarine habitats, this species also migrates into freshwater during the flood season. It spawns in floodplain habitats, probably in freshwater and is reported to inhabit deep pools in the mainstream Mekong for at least part of the year.

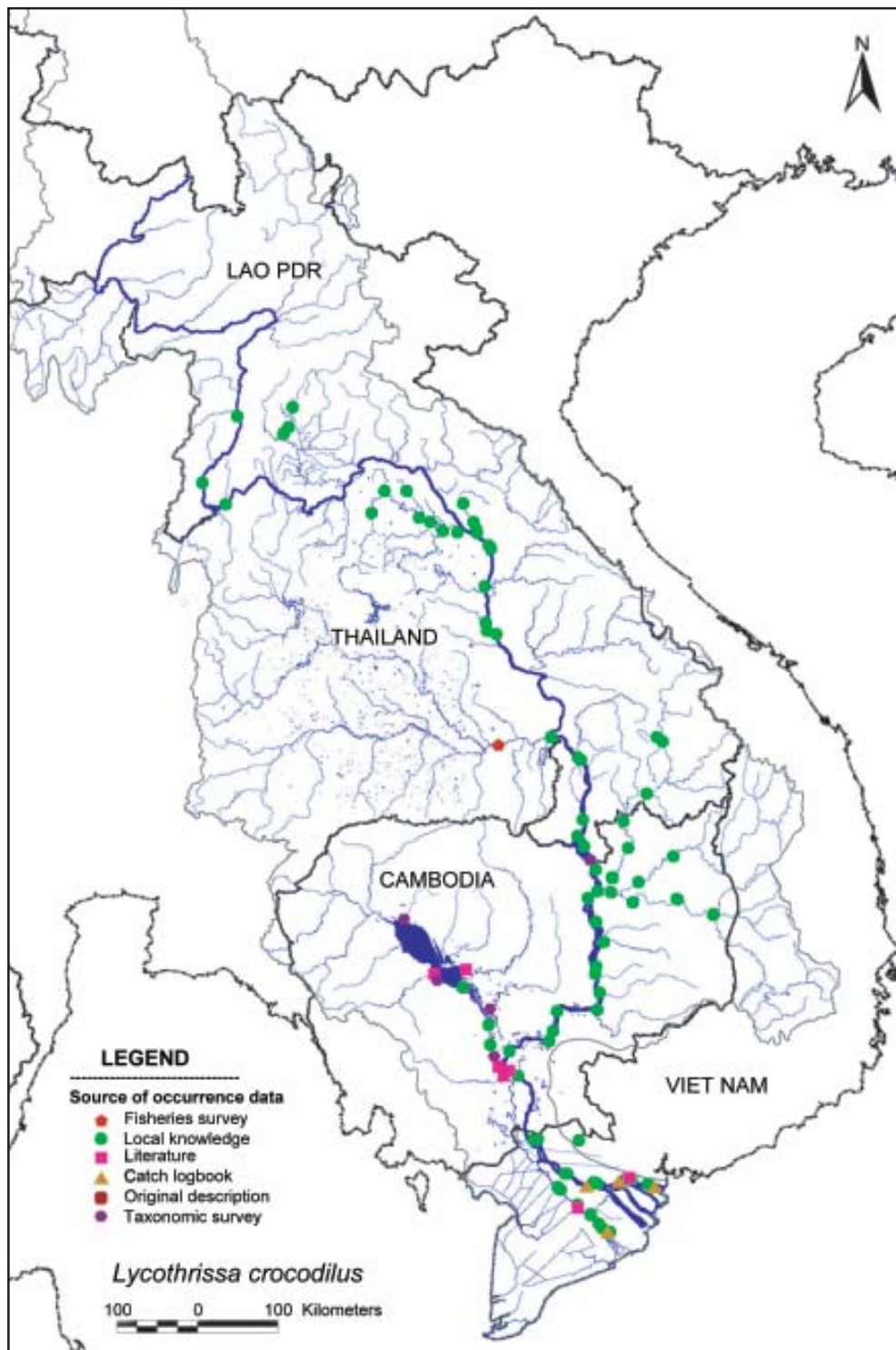
### Life Cycle

Migration has been observed upstream from the Delta during the dry season from October to March and downstream at the onset of the rainy season, from May to July. Developing eggs are mostly found around March to April. This suggests that eggs develop during the dry season and spawning is believed to occur from late in the dry season to the early flood season<sup>1</sup>.

### Fisheries

An important fish in fisheries of the estuary of the Mekong delta, this anchovy has been observed in very large amounts in “tidal *dai*” fisheries in Tra Vinh Province, Viet Nam, at the mouth of the Mekong (Anders Poulsen, pers. obs.). The fish are mainly sun-dried. It is commonly used in the fish sauce industry.





## *Mekongina erythrospila* Fowler, 1937



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Striped river barb
<b>Khmer:</b>	Trey pa sa-ee
<b>Lao:</b>	Pa sa-ee
<b>Thai:</b>	Pla sa-ee
<b>Vietnamese:</b>	Ca da song

**World Distribution:** endemic to the Mekong basin

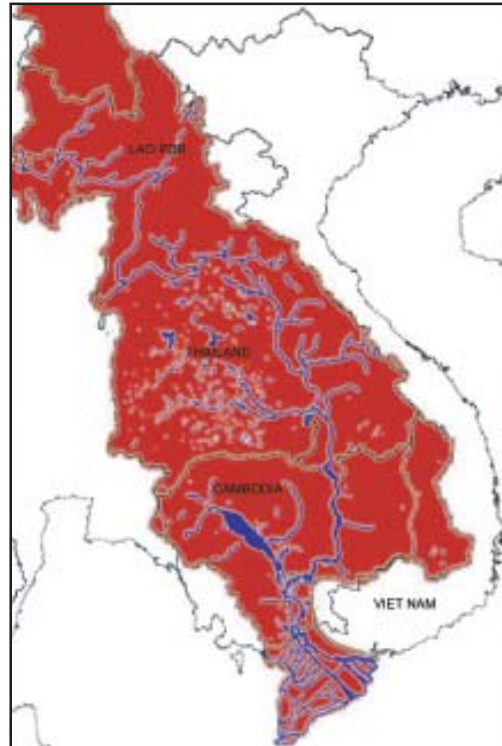
**Mekong Distribution:** occurs from Kratie in the South up to the border between Lao PDR, Thailand and Myanmar in the North, mainly in the Mekong mainstream and in the Sesan catchment. It has also been recorded at Xe Bangfai, Nam Theun (Kottelat, 2000) and Xe Done (Noraseng et al. undated). It is one of the three species of the “pa wa – pa saee complex” (Roberts and Warren, 1994); the other two species being *Labeo cf. pierrei* and *Bangana behri*. This species complex is centred on the Sesan tributary system and the Mekong between Kratie (Cambodia) and Pakse (Lao PDR).

**Feeding:** herbivorous or algivorous, feeding on green algae, periphyton and phytoplankton.

**Size:** up to 45 cm.

### Population structure

Two main populations of *Mekongina erythrospila* exist in the Mekong mainstream. A northern population occurs from Xayaboury and upstream (this could in fact be a different species), while a southern population occurs between Sambor and Mukdahan. The southern population also includes the Sesan, Sekong and Srepok Rivers.



### Critical habitats

**Spawning habitats:** spawning is believed to occur in the Mekong mainstream at the onset of the monsoon season. Habitat requirement is not known.

**Feeding habitats,** thought to feed in river channel habitats, in areas with rocks and boulders and possibly also in areas of flooded vegetation.

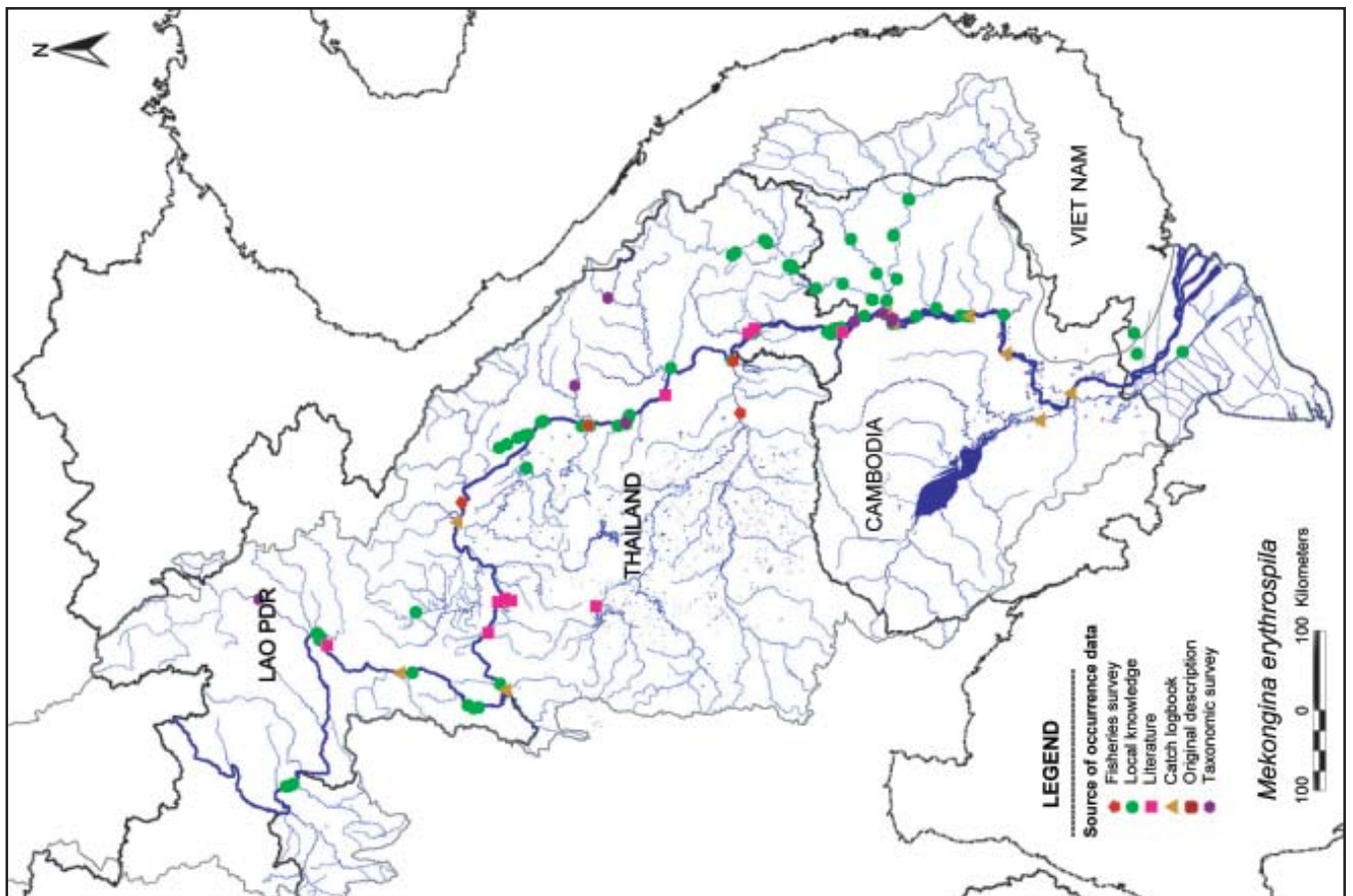
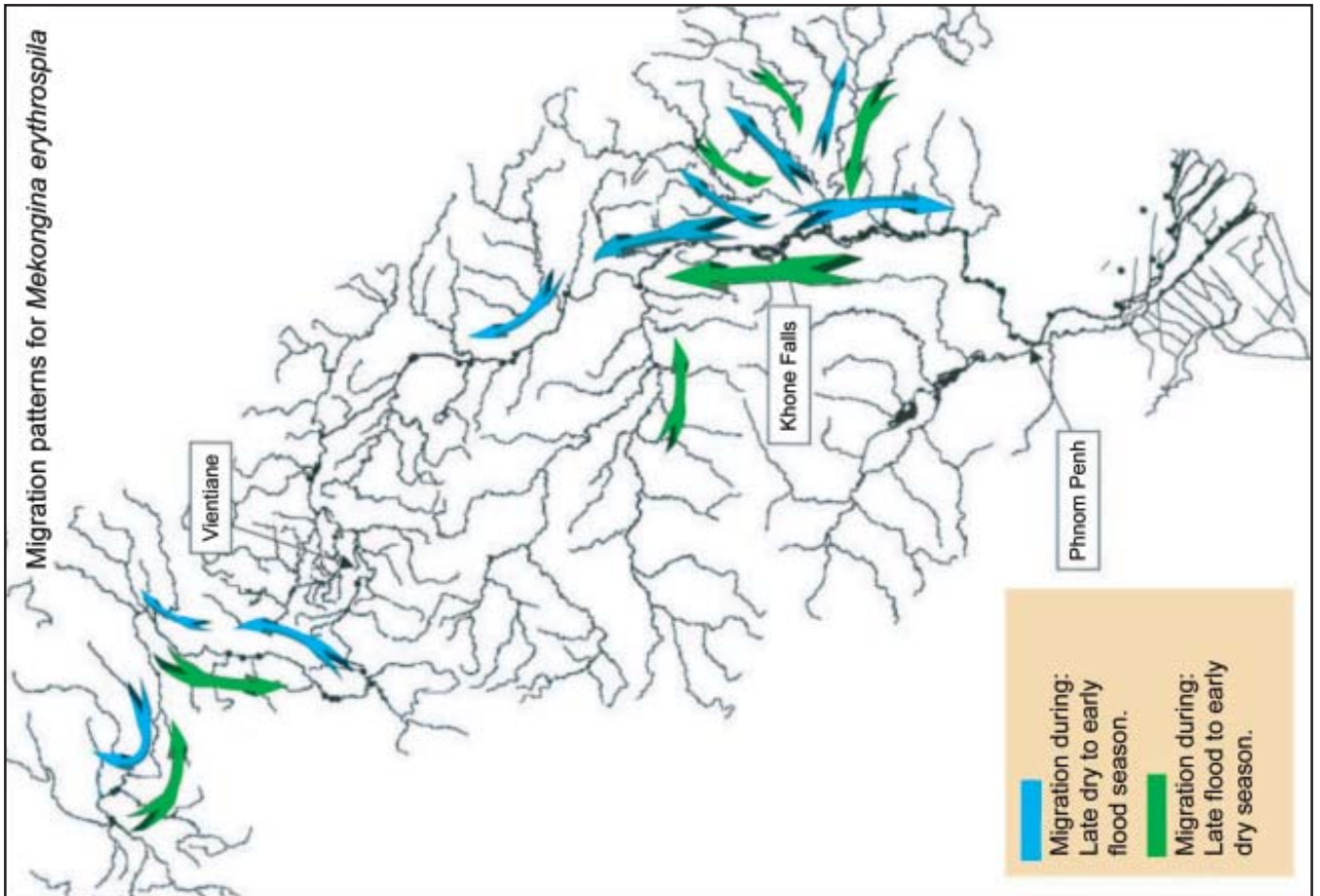
**Refuge habitats:** spends the dry season in or near deep pool habitats<sup>1</sup>.

### Life Cycle

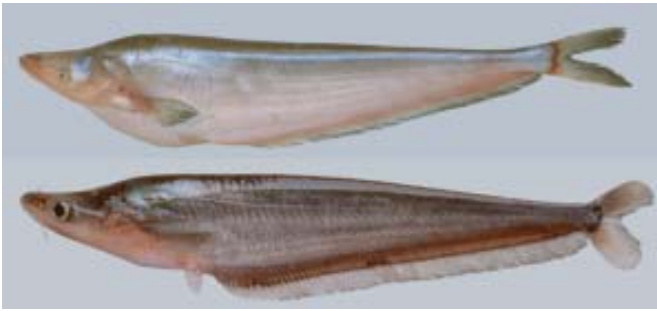
Although little can be concluded about the life cycle of *Mekongina erythrospila*, it is a migratory species, which is important during the dry season migrations around the Khone Falls from December to March (Warren et al. 1998). These migrations reach as far as Pakse town. *Mekongina erythrospila* migrates in big schools comprising several hundred fish, often together with other cyprinids and loaches such as *Hypsibarbus* spp., *Scaphognathops* spp., *Henicorhynchus siamensis* and *Botia modesta*<sup>1</sup>. These migrations are believed to be trophic/dispersal migrations (Warren et al. 1998).

### Fisheries

*Mekongina erythrospila* is important in the fisheries of the border areas between Lao PDR and Cambodia, where it constitutes an important trans-boundary fishery resource. It is of particular importance in the Sesan/Srepok/Sekong sub-catchment.



## *Micronema apogon* (Bleeker, 1851) and *M. bleekeri* (Günther, 1864)



<b>Family:</b>	Siluridae (Sheatfishes)
<b>English:</b>	Silver sheatfish
<b>Khmer:</b>	Trey kes prak <i>and</i> Trey kes krahawn
<b>Lao:</b>	Pa nang <i>and</i> Pa nang ngern, also Pa ket
<b>Thai:</b>	Pla nam ngern <i>and</i> Pla nang dang
<b>Vietnamese:</b>	Ca ket

Three species of the genus *Micronema* have been recorded in the Mekong. The two species *Micronema apogon* and *Micronema bleekeri*, resemble each other closely and probably have similar ecological characteristics (Rainboth, 1996). They are not always separated in catches, although fishers can distinguish each species.

**World Distribution:** Mekong and Chao Phraya System, Thailand, south through the Malay Peninsula to western Indonesia and Borneo. *M. bleekeri* is found in the Mekong and Chao Phraya basins, and south through the Malay Peninsula.

**Mekong Distribution:** Both species occur basin-wide. Found mainly in large rivers with turbid waters and adjacent streams and canals but also in lakes as well as impoundments.

**Feeding:** carnivorous - *M. apogon* feeds mainly on pelagic fishes and large crustaceans. *M. bleekeri* feeds mainly on small fishes, shrimps and insect larvae.

**Size:** 130 cm. and 60 cm. respectively.

### Population structure

Several populations are expected to occur throughout the basin.

### Critical habitats

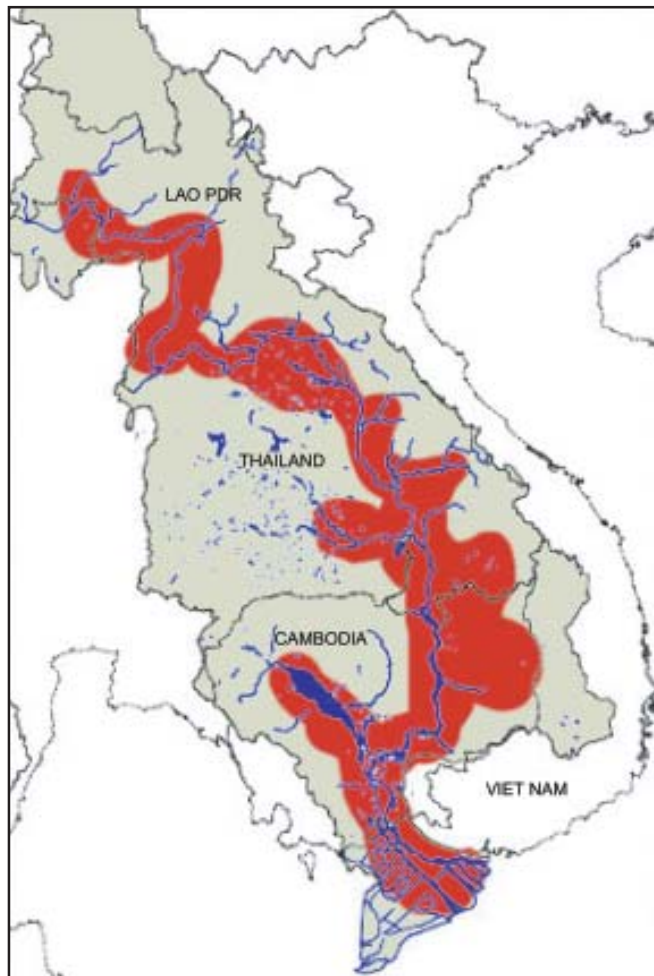
*Spawning habitats:* both species are believed to spawn on floodplains.

*Feeding habitats:* the young and sub-adults feed on floodplains during the monsoon season. Large fish feed in river channels, where they prey on fishes, crustaceans and insects.

*Refuge habitats:* both species live in deep pool habitats during the dry season<sup>1</sup>.

### Life Cycle

Both *Micronema bleekeri* and *Micronema apogon* undertake lateral migrations from the Mekong River into smaller tributaries and into the floodplains at the onset of the flood season, returning to the main river channel at the beginning of the dry season<sup>1</sup>. Migration is triggered by the first rain at the end of the dry season





and by water level changes. In addition, the migrations are also under lunar influence, particularly in Cambodia, where migrations out of floodplain habitats occur on, or immediately before, the full moon<sup>1</sup>.

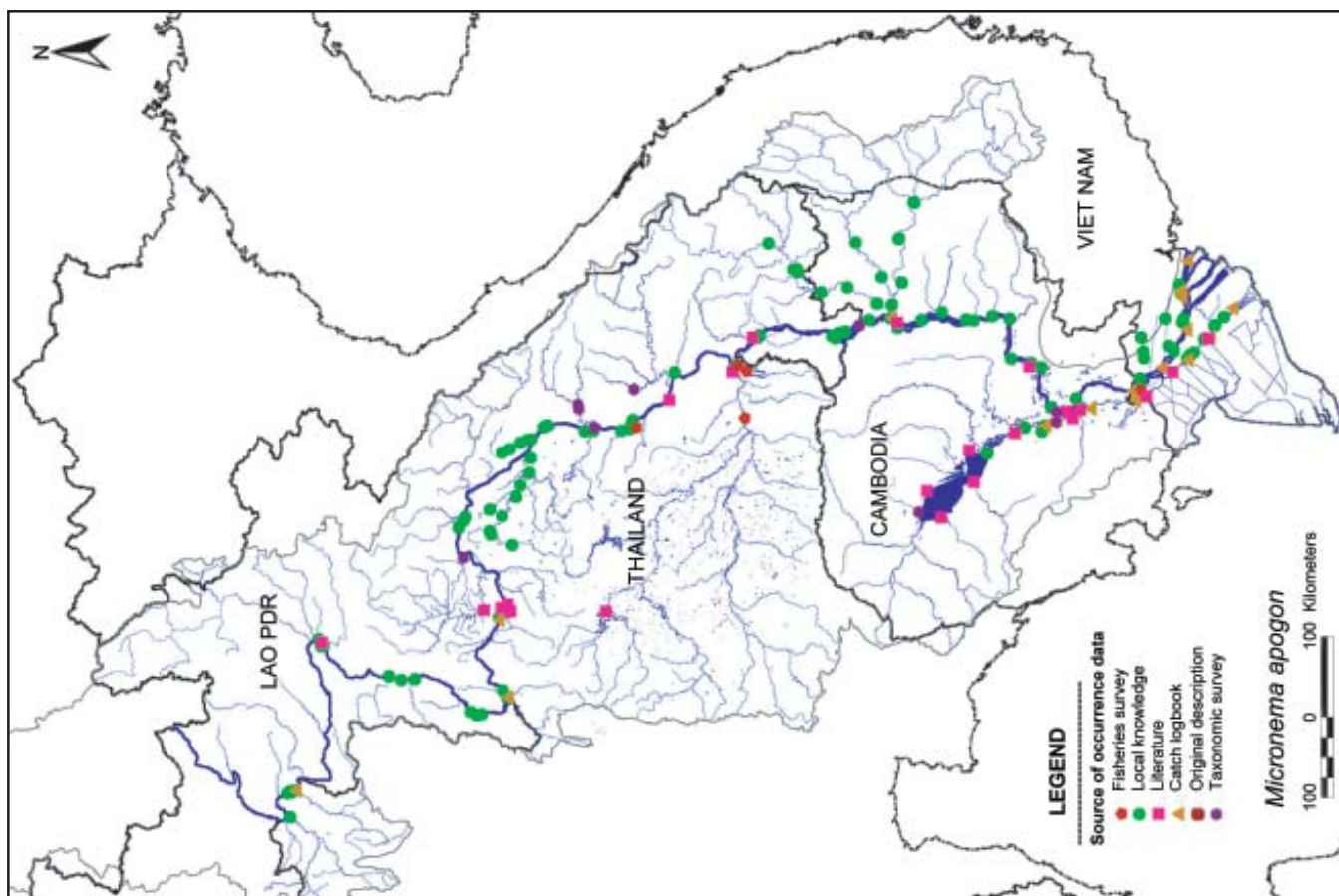
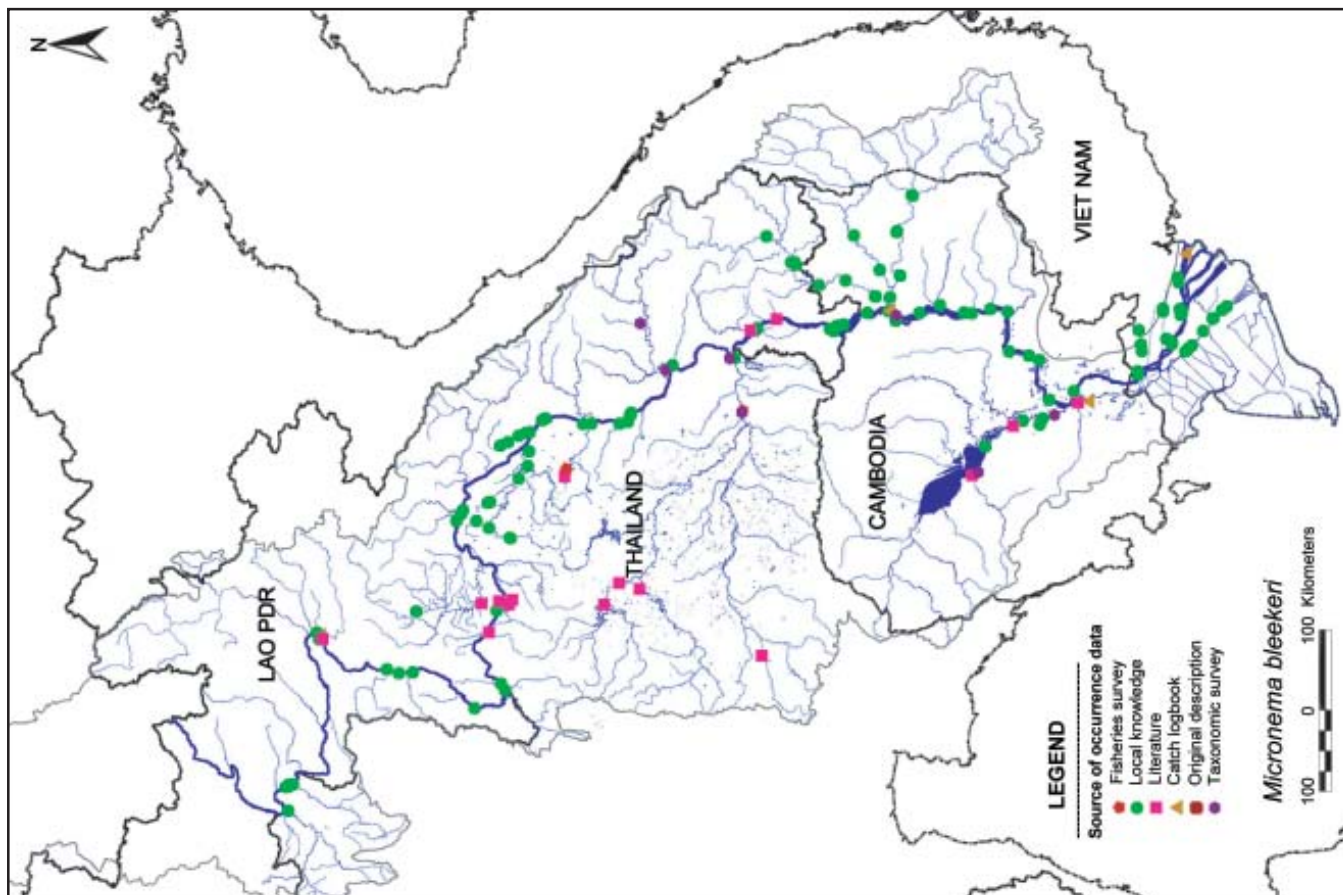
In the lower reaches, lateral migrations are followed by longitudinal migrations within the Mekong mainstream<sup>1</sup>, presumably to reach their dry-season refuge habitats in deep pools along the river<sup>1</sup>. Spawning occurs for both species at the onset of the flood season, probably on the floodplain. The larvae and juveniles spend the monsoon season feeding on the floodplains.

### **Fisheries**

Both species are important, high-value fish in the fisheries throughout their range. Large amounts are exported from Cambodia to Thailand.

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<sup>1,2,3,4</sup> See page 20 for information on footnotes



## *Notopterus notopterus* (Pallas, 1769)



<b>Family:</b>	Notopteridae (Featherbacks or Knifefishes)
<b>English:</b>	Bronze featherback
<b>Khmer:</b>	Trey Slat
<b>Lao:</b>	Pa tong na; Pa tong noi; Pa tong
<b>Thai:</b>	Sa-lard, tong
<b>Vietnamese:</b>	Ca that lat

**World Distribution:** widespread from India, through Myanmar to Southeast Asia, including Malaysia and Indonesia, but not in Borneo.

**Mekong Distribution:** basin-wide, in moderately shallow waters in large rivers, streams and in standing and sluggish waters of lakes, floodplains, canals and ponds.

**Feeding:** feeds on insects, shrimps, vegetation, fish, and earthworms, (listed in order of importance); and also seeds, crustaceans, young roots of aquatic plants, crabs, molluscs and detritus.

**Size:** up to 60 cm, more commonly 25 cm.

### Life cycle

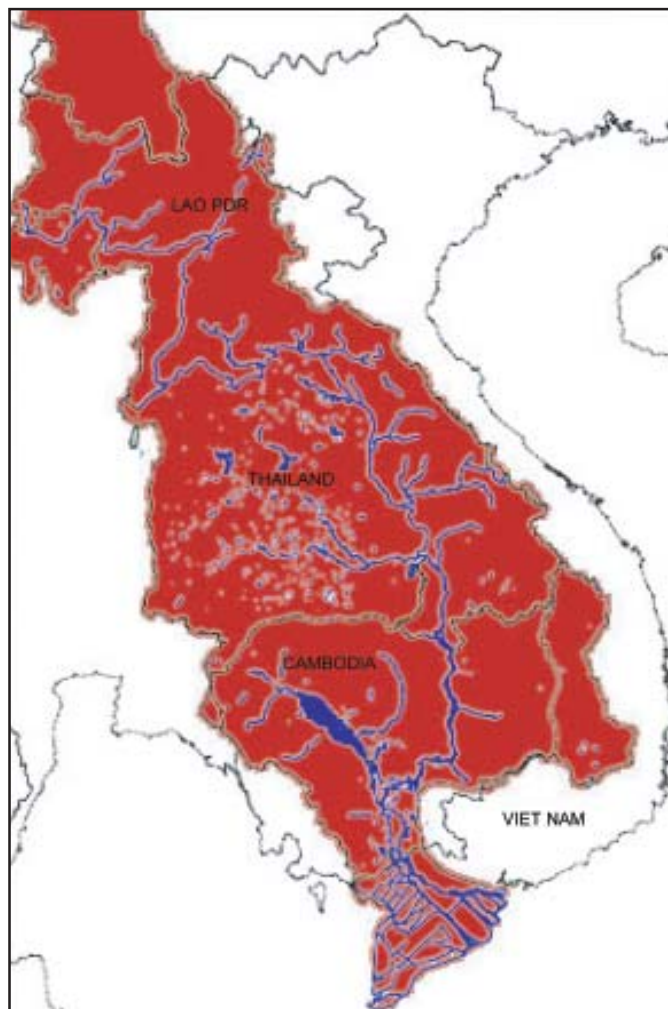
Fishermen throughout its distribution range report that the species only undertakes localised lateral migrations from the Mekong River to floodplains during the flood season, and back to the main river or other permanent water bodies during the dry season. In the Lao PDR and Thailand however, the species is common in the Mekong mainstream as well as its tributaries, living in pools with submerged wood and shrubs. At several places, it was reported to move into tributaries during the flood season, where it apparently spawns.

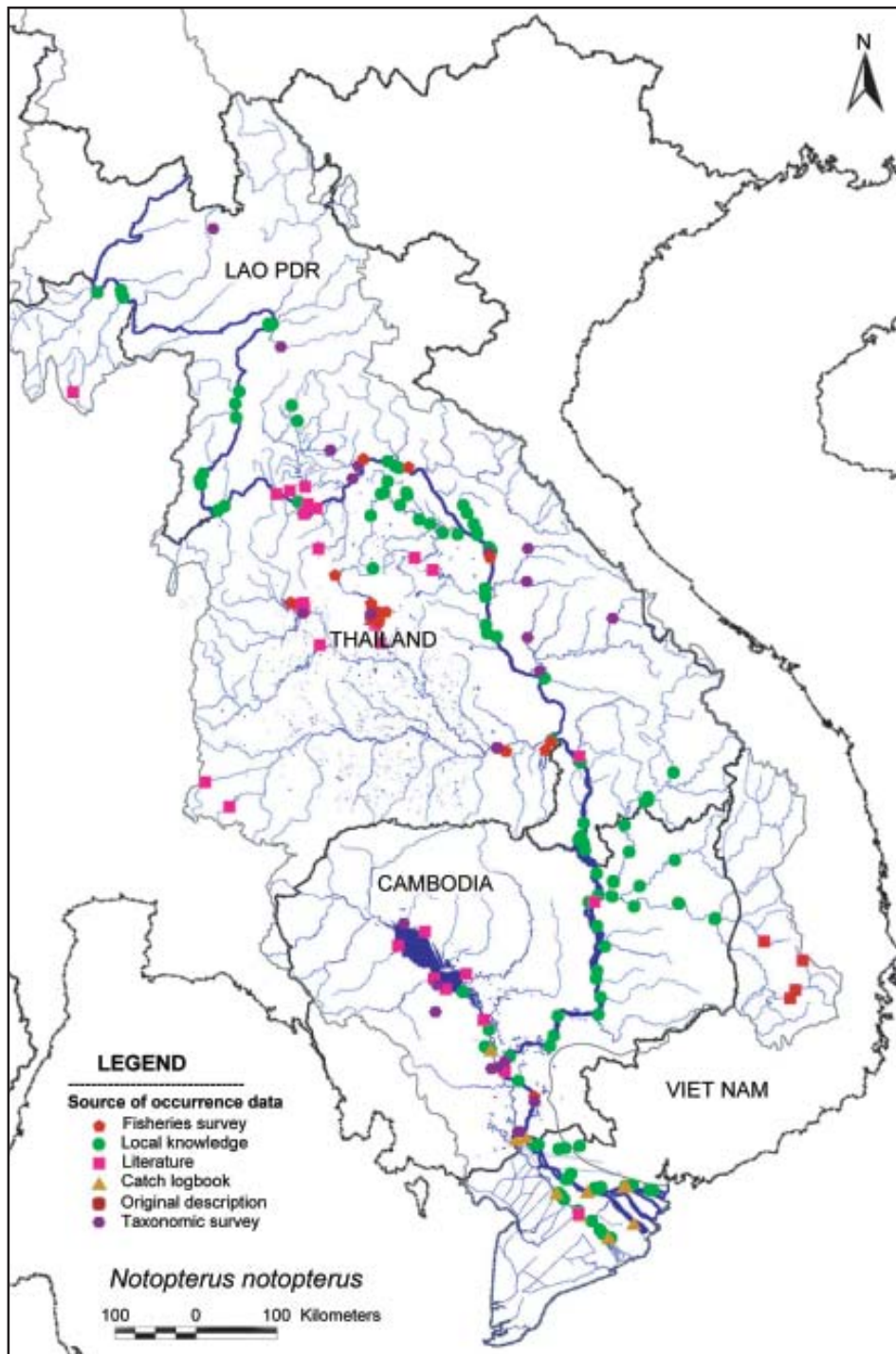
Reports suggest that the species spawns twice a year, in May/June and in September-November. Spawning behaviour has been reported in floodplain habitat, as well as associated with submerged vegetation in deep pools of rivers.

### Fisheries

Caught by seines, lift-nets, weirs, barrages, gill net, hook-and-line, cast net, *lee* traps, and *tone* traps. Consumed both in fresh and dried state, often used in soups and reportedly used to treat measles.

Large numbers are shipped on ice from fish landings around the Great Lake to markets in Thailand.





## *Osteochilus hasseltii* (Valenciennes, 1842)



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Nilem carp
<b>Khmer:</b>	Trey kros
<b>Lao:</b>	Pa mak buup; Pa kyka pher; Pa i thai
<b>Thai:</b>	Pla khao e-thai
<b>Vietnamese:</b>	Ca dam lui

**World Distribution:** widespread in Southeast Asia, from Myanmar to Malaysia and western Indonesia and in Borneo.

**Mekong Distribution:** a common species that occurs basin-wide. It has also established viable populations in many reservoirs.

**Feeding:** omnivorous – feeding mainly on periphyton, phytoplankton, algae, plant roots and debris, annelids and crustaceans

**Size:** up to 30 cm, more commonly 20 cm.

### Population structure

*Osteochilus hasseltii* has many sub-populations throughout the Mekong basin, each undertaking short migrations from rivers to flood-plain habitats at the onset of the flood season, and returning to river habitats at the end of that period. Each major tributary may hold its own distinct population.

### Critical habitats

*Spawning habitats:* spawning occurs from the onset of, and late into, the monsoon season, in floodplain habitat associated with submerged vegetation.

*Feeding habitat;* both young and older fish feed in floodplain habitat during the monsoon season.

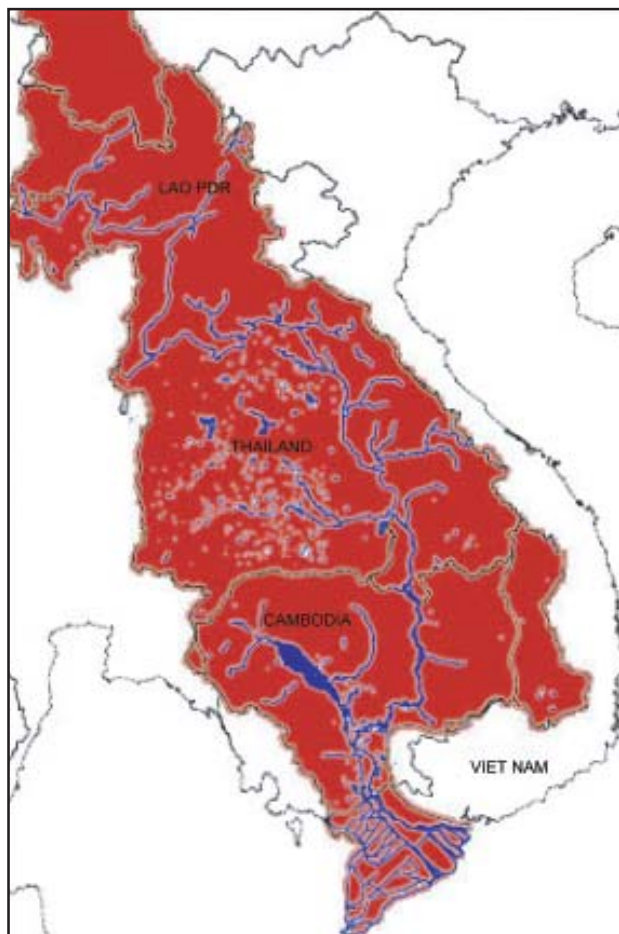
*Refuge habitat;* seeks refuge in slow-flowing riverine habitats during the dry season, among tree roots, brush piles and other submerged objects which provide hiding opportunities for the fish. Some fish also move to standing-water habitats such as swamps and floodplain lakes during the dry season.

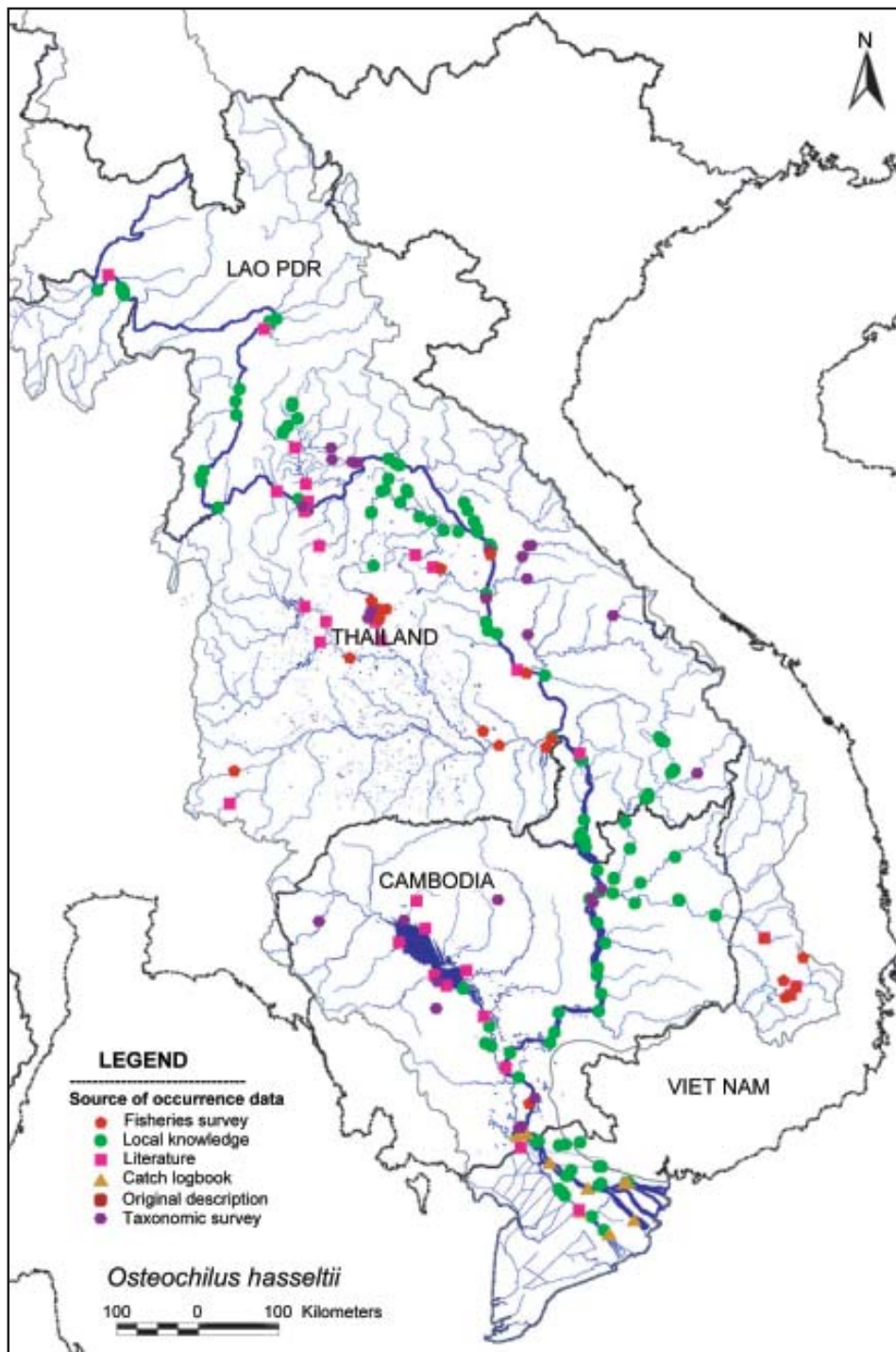
### Life Cycle

*Osteochilus hasseltii* mainly lives in smaller tributaries and, during the onset of the flood season, migrates to flooded areas. At the end of the monsoon season, the species migrates back to the riverine habitats in tributaries and, to a lesser extent the Mekong mainstream. It can attain sexual maturity at the age of 8-10 months and a length of 15 cm.

### Fisheries

*Osteochilus hasseltii* is an important species throughout its range. It is also important in reservoir fisheries, and is the most abundant species in the Nam Ngum Reservoir fisheries of Lao PDR.





## *Pangasianodon gigas* Chevey, 1930



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Giant Mekong catfish
<b>Khmer:</b>	Trey reach
<b>Lao:</b>	Pa beuk
<b>Thai:</b>	Pla beuk
<b>Vietnamese:</b>	Ca tra dau

This is the largest and most famous fish of the Mekong basin, considered one of the fastest-growing fishes in the world and cited in the Guinness Book

of Records as the largest freshwater fish. The species is listed on several international conventions, including the IUCN “Red List” of endangered animals (critical World Distribution), CITES Appendix 1, and the Bonn Convention, Appendix 1.

**World Distribution:** endemic to the Mekong basin.

**Mekong Distribution:** formerly distributed throughout the lower Mekong Basin, probably extending into the Chinese part of the river, now it is extremely rare throughout its range. Only occurs at mid water to bottom levels in the Mekong mainstream.

**Feeding:** herbivorous – feeds mainly on algae (fish-size stones are sometimes found in its stomach, believed to have been accidentally swallowed during feeding).

**Size:** Up to 300 cm. and 300 kg.

### Population structure

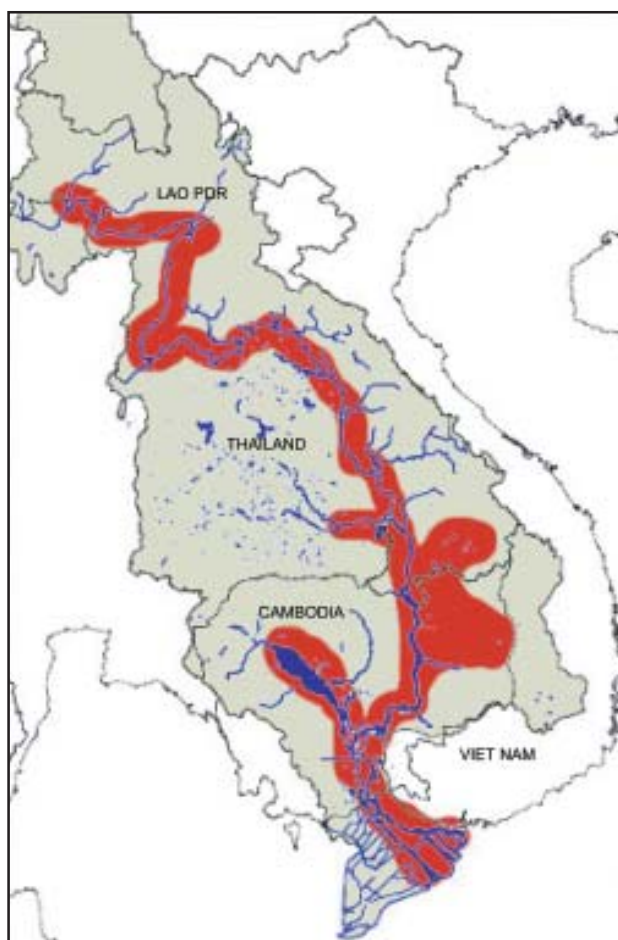
It is not known whether this species comprises a single population covering the entire basin, or two distinct sub-populations, one in the lower and one in the upper reaches. We may never know, as it is now so rare.

The fact that only one spawning migration has been firmly established throughout the basin (in the upper reaches near Bokeo – Chiang Khong) suggests that only one population exists. However, spawning may also occur in northern Cambodia (e.g. between Kratie and Stung Treng), where the species has been sporadically reported.

### Critical habitats

*Spawning habitats:* spawning takes place in the Mekong mainstream, although exact locations have not been identified. The mature fishes caught during their spawning migrations in April-May in the upper reach of the Mekong are believed to spawn at rapid-pool habitats further upstream.

*Feeding habitats:* the young feed on floodplains associated with the Great Lake system and the Mekong delta in Viet Nam and possibly elsewhere in the basin.



*Refuge habitats:* large individuals of the giant catfish are reported to spend the dry season in deep pools, e.g. along the Kratie – Stung Treng reach in Cambodia and the Xayaboury reach in Lao PDR (Poulsen, et al. 2001).

### **Life Cycle**

Large parts of the life cycle of this elusive species are still not known. No small juvenile specimens of the species have, for instance, ever been recorded in the wild, although young fish have been reported from the Great Lake of Cambodia. Spawning habitats have not been firmly established anywhere in the basin.

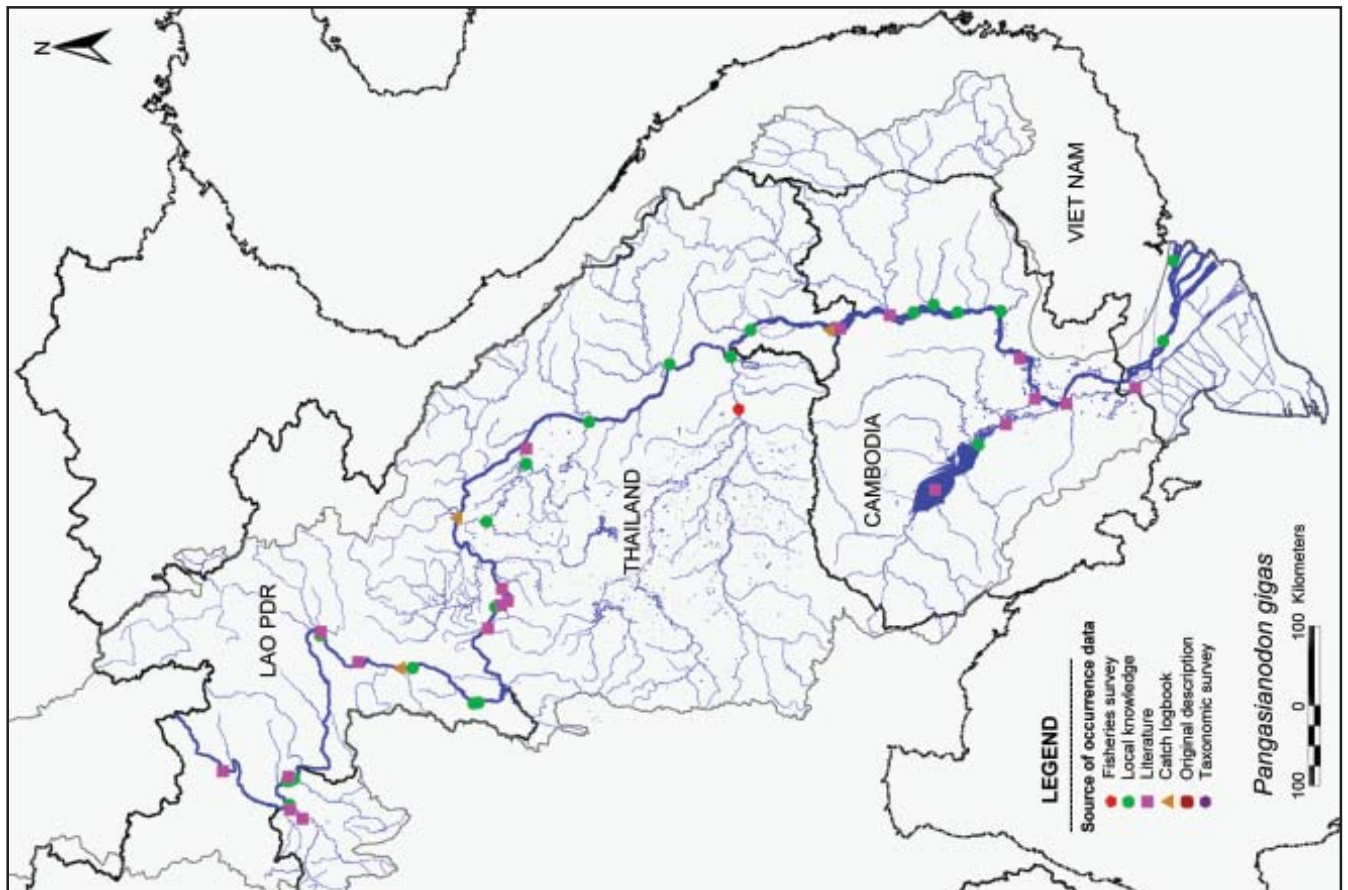
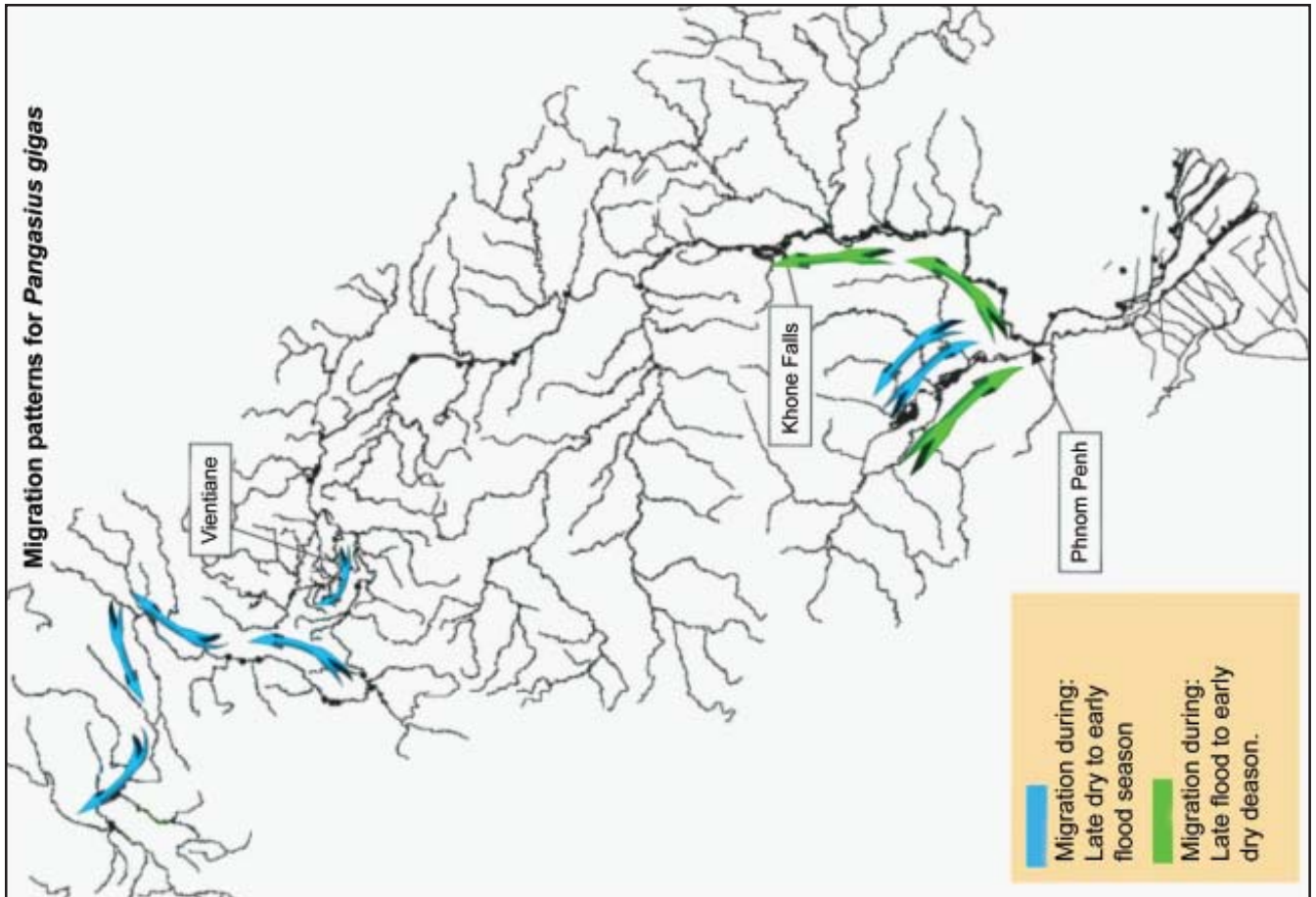
The Giant Mekong catfish is thought to spawn late in the dry season (April-May) and juveniles are believed to drift downstream and out onto floodplain habitats associated with the Tonle Sap – Great Lake system of Cambodia.

Spawning migrations have been known for a long time, but only in the upper reaches, upstream of Vientiane.

### **Fisheries**

Although *Pangasianodon gigas* appears to have previously been relatively common in parts of the Mekong River along the Lao-Thai border (e.g., near Nong Khai and Vientiane), the giant catfish is now extremely rare along that stretch, as indeed throughout the basin. It therefore no longer has significant value in the fisheries. However, it still embodies an important cultural value, particularly in Lao PDR and Thailand. For instance, in Bokeo - Chiang Khong in the upper reach of the river, the annual fishery for the species is more a cultural event that takes place every year in April – May and is preceded by a traditional ceremony. This is the only remaining site where a fishery for the species still exists, however during the 2001 and 2002 seasons no fish were caught. It is the subject of a breeding program in Thailand and many fish are now being reared in ponds.





## *Pangasianodon hypophthalmus* (Sauvage, 1878)



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Sutchi River Catfish
<b>Khmer:</b>	Trey pra
<b>Lao:</b>	Pa suay kheo, Pa suay
<b>Thai:</b>	Pla saa whai, Pla suey
<b>Vietnamese:</b>	Ca tra song

**World Distribution:** Mekong, and Chao Phraya System, Thailand.

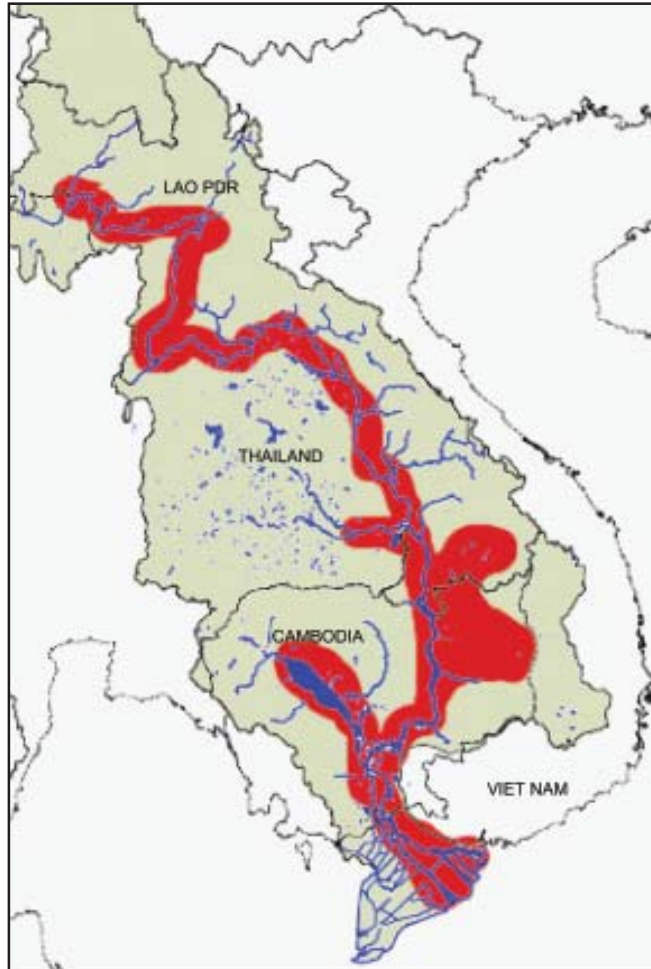
**Mekong Distribution:** occurs throughout the lower Mekong Basin, possibly extending into China. Normally found in large rivers (Rainboth 1996), but can live in both standing and running water.

**Feeding:** omnivorous – feeds mainly on crustaceans, fish, fruits, debris and forest vegetation.

**Size:** up to 150 cm.

### Population structure

At least two distinct populations are thought to occur. An upper Mekong population extends approximately from the mouth of the Loei River and upstream toward the border with Myanmar/China. A lower Mekong population is larger, and supports important fisheries throughout its distribution range. It extends from the Mekong delta in Viet Nam, into the Tonle Sap / Great Lake system and as far upstream as the Khone Falls. There may also be a small population in the middle Mekong with a distribution range from below the Khone Falls and upstream to the confluences of some of the major tributaries such as the Mun River, Xe Bang Fai River and Songkhram River. This population may partly overlap with the lower migration, both spatially and genetically. Finally, there may be a distinct population, partially overlapping with the downstream population. It extends into the Sesan tributary system, including the Sesan, Srepok and Sekong rivers, and has been reported as far upstream in the Sekong River as Ban La Vi in Lao PDR!



### Critical Habitats

**Spawning habitats:** *Pangasianodon hypophthalmus* spawns in the Mekong mainstream at the beginning of the flood season. The sticky eggs are deposited on root systems of the rheophilic tree species, *Gimnema asiatica* (Touch, 2000). The lower population spawns along the stretch from Kratie to Stung Treng in Northern Cambodia. The spawning grounds of the other populations are not known.

**Feeding habitats:** juveniles and sub-adults of *Pangasianodon hypophthalmus* feed in floodplain habitats.

The main feeding habitat for the lower population of the species, and possibly also the Sesan population, is the extensive floodplains in the Tonle Sap / Great lake system, Southern Cambodia and the Mekong delta in Viet Nam. The feeding habitats of the upper population are mainly associated with floodplains of major tributaries, such as the Songkhram River<sup>1</sup>. The feeding grounds of the early juvenile stages of this population may be less dependent on floodplain habitats.

*Refuge habitats:* during the dry season, *Pangasianodon hypophthalmus* lives in deep pool habitats in the Mekong River<sup>1</sup>. The lower population spends the dry season in deep pools along the stretch from Kratie to Stung Treng in Northern Cambodia, whereas the upper population is concentrated along the stretch from the mouth of the Loei River to Louang Prabang<sup>1</sup>.

### Life Cycle

A 10 kg female can produce around 1,000,000 eggs. After spawning, the early larval stage drifts downstream with the water current and eventually enters its rearing and feeding habitats on the floodplains. For the upper population, the early larval stages may depend mainly on fringing floodplains and flooded islands in braided sections of the river (e.g. around Khone Falls and further upstream, above the mouth of the Mun River).

At the onset of the dry season in October, the falling water levels trigger fish to move out of floodplain areas and into main river channels. Eventually, they end up in the Mekong River, where they start upstream migrations towards dry season refuge habitats. The movements are also under lunar influence, since they mainly occur just before, and during, the full moon period. The movements continue until February, but peak in November-December<sup>1</sup>.

The next monsoon season (May-June) triggers mature members of the species to undertake upstream spawning migrations. Individuals, which are not yet mature, migrate back downstream towards floodplain habitats (lower population), or upstream and into tributary floodplains (upper population, middle population)<sup>1</sup>.

In general, the fish from the Mekong delta are below 50 cm, with the majority being below 30 cm<sup>1</sup>. Larvae of the lower population drift downstream from spawning sites between Kratie and the Khone Falls at the beginning of the flood season<sup>4</sup>. When they reach southern Cambodia and Viet Nam, they are swept into floodplain areas. The reversal of the Tonle Sap flow at this time ensures that the larvae are also able to enter floodplains associated with this system, including the Great Lake.

### Fisheries

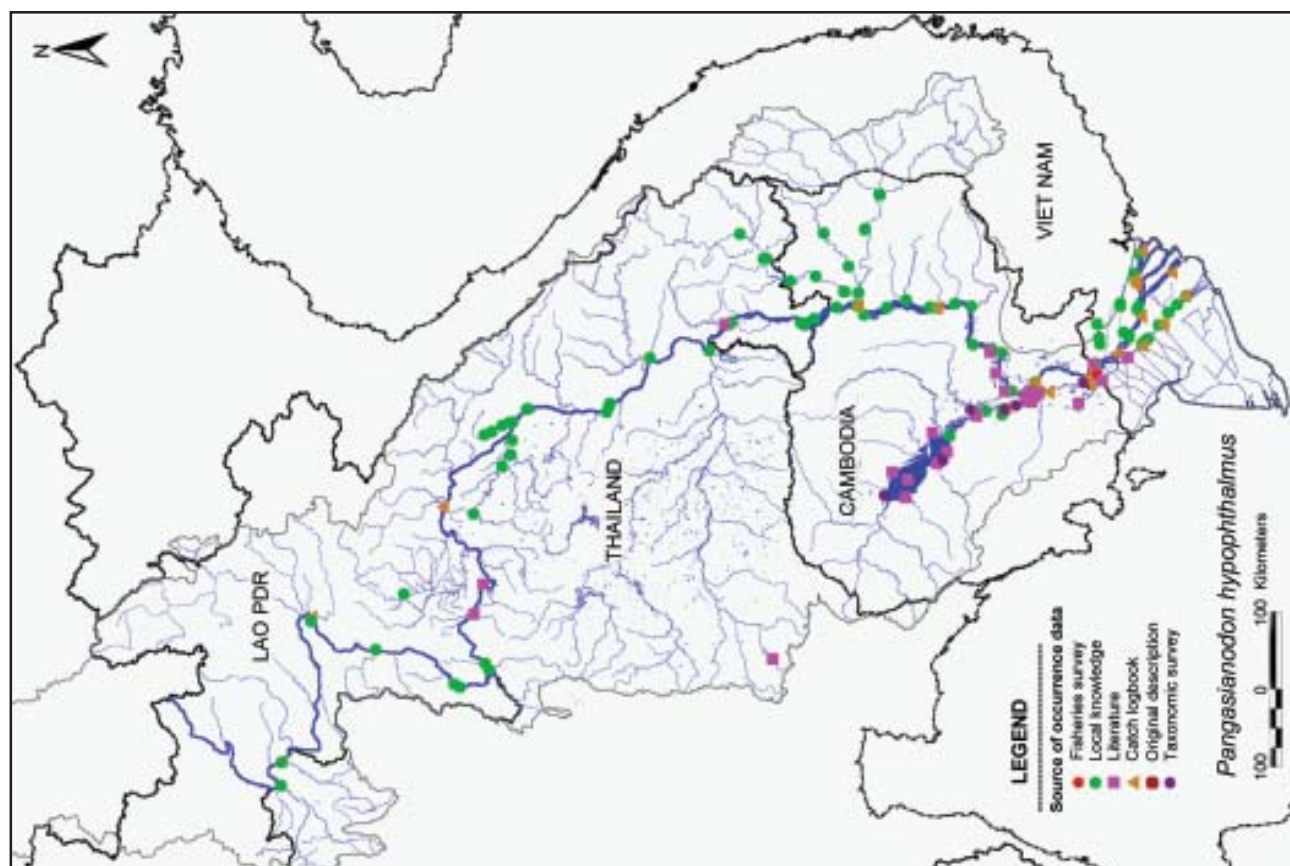
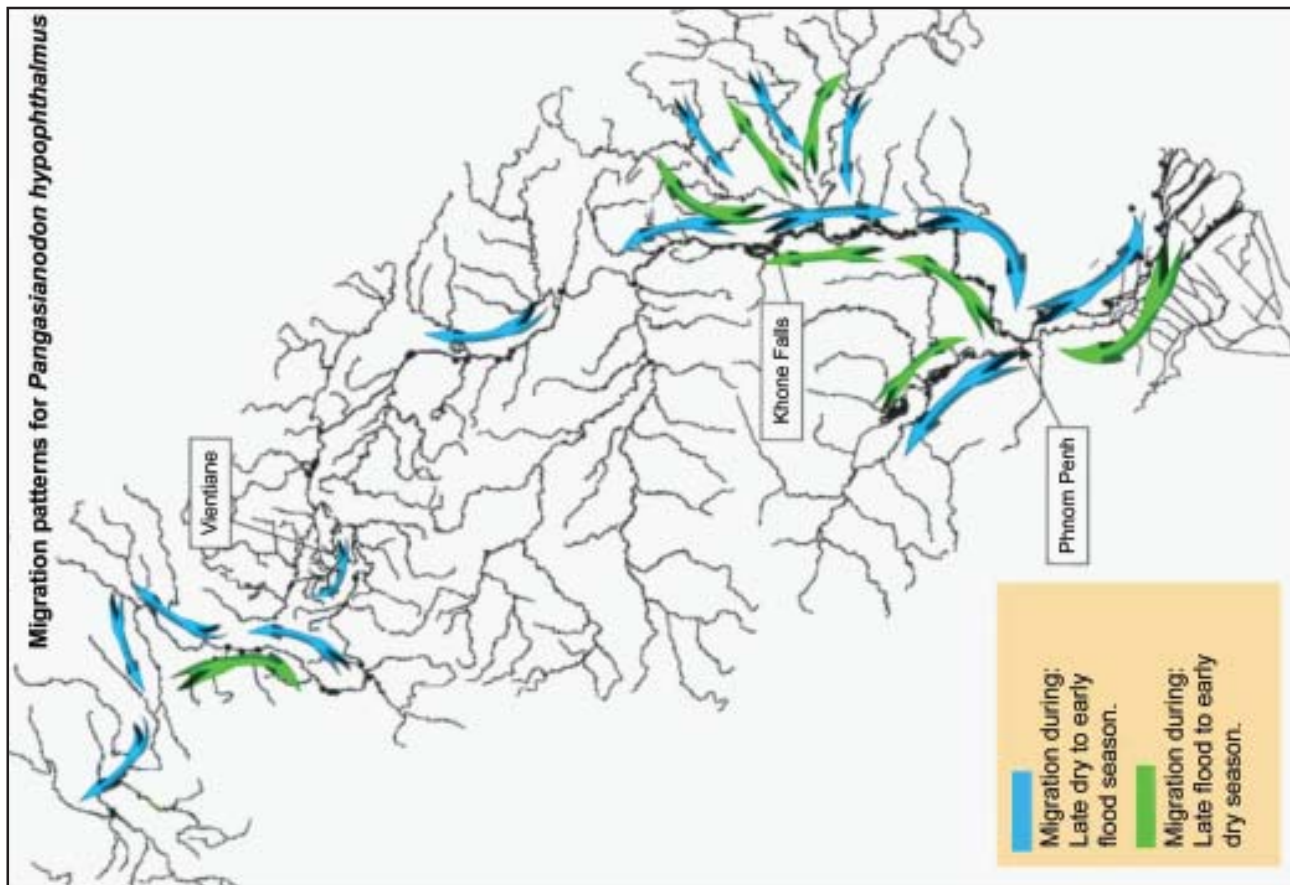
*Pangasianodon hypophthalmus* is an important aquaculture species. Until recently, the basis for its use in aquaculture in the Mekong delta in Viet Nam was the capture of larvae from the Mekong and Bassac rivers. For instance, in An Giang and Dong Thap provinces of Viet Nam, large numbers of larvae are caught every year in June-July during their downstream drift from upstream spawning sites in Cambodia<sup>4</sup> (Nguyen et al. 2001; Trong et al. 2002). Until recently, large numbers were also caught in Southern Cambodia (van Zalinge et al. 2002).

Throughout its lower range, *Pangasianodon hypophthalmus* is an important species in fisheries. It is caught in large amounts in the Tonle Sap and Great Lake fisheries, for instance in the arrow-shaped trap fishery. At the Khone Falls, it is caught during its migration over the falls during the period from May to July, although less consistently compared to other pangasiids (Baird, 1998).

It is also caught sporadically in the middle and upper sections of the Mekong, particularly in the early monsoon period from May to July<sup>1,3</sup>.

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<sup>1,2,3,4</sup> See page 20 for information on footnotes



## *Pangasius bocourti* Sauvage, 1880



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Bocourt's catfish
<b>Khmer:</b>	Trey pra kchau
<b>Lao:</b>	Pa nyang, Pa phoh hua
<b>Thai:</b>	Pla yang, Pla ai dong
<b>Vietnamese:</b>	Ca ba sa

**Taxonomy:** the taxonomy of this species is problematic. It has been suggested that the species currently regarded as *Pangasius bocourti* could in fact be another, so far undescribed, species (Poulsen and Valbo-Jørgensen, 2001). As with many other Mekong fish, there is an urgent need to clarify the taxonomy of this species in the Mekong context (i.e., type specimens originate from relatively few sites within the Mekong).

**World Distribution:** Mekong, and Chao Phraya System, Thailand.

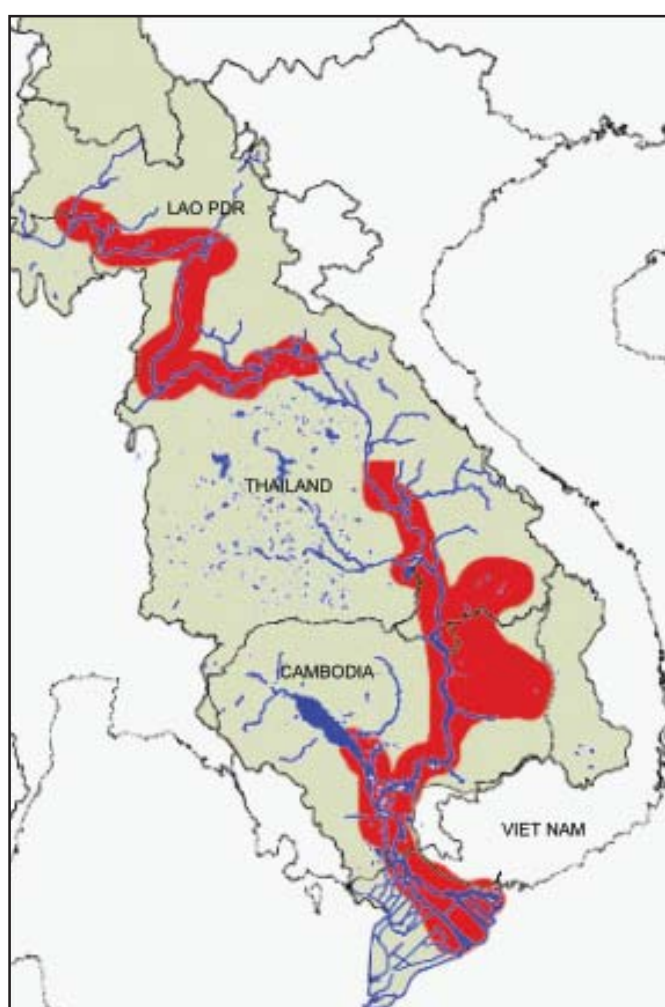
**Mekong Distribution:** occurs basinwide, found in rapids and deeper slower reaches. There are probably two different populations in the Mekong. One occurs from the Mekong Delta in Viet Nam to the Mukdahan-Savannakhet area upstream from the Khone Falls. Another population occurs from around Boulikhamxay-Nong Khai provinces to around Chiang Rai - Bokeo provinces in the North.

**Feeding:** omnivorous – feeds on plant material, such as fruits and leaves (flood season), fish, molluscs, shrimps and algae (dry season).

**Size:** up to 100 cm.

### Population structure

There are two distinct populations of *Pangasius bocourti* in the Mekong River. One occurs from the Mekong delta in the south, and upstream approximately to the Mukdahan-Savannakhet area. This population may consist of two sub-populations with some degree of genetic overlap. The second population occurs from the area around Boulikhamxay-Nong Khai provinces to Chiang Rai-Bokeo provinces in the north. This population may in fact constitute a separate species.



### Critical habitats

**Spawning habitats:** spawning occurs in the Mekong mainstream. No information is available on exact spawning location and behaviour. Larvae of the species are found in the Mekong and Bassac rivers in Viet Nam<sup>3</sup> and are believed to originate from spawning grounds far upstream, i.e. possibly beyond the Khone Falls.

**Feeding habitats:** juveniles and sub-adults use flooded areas as nursery and feeding habitats and mainly feed on plant material. Large individuals stay in the main river channels, where they feed on a range of food items.

*Refuge habitats:* *Pangasius bocourti* spends the dry season in deep pool refuges in the Mekong mainstream, particularly along the stretch from Kratie to Khone Falls<sup>1</sup>.

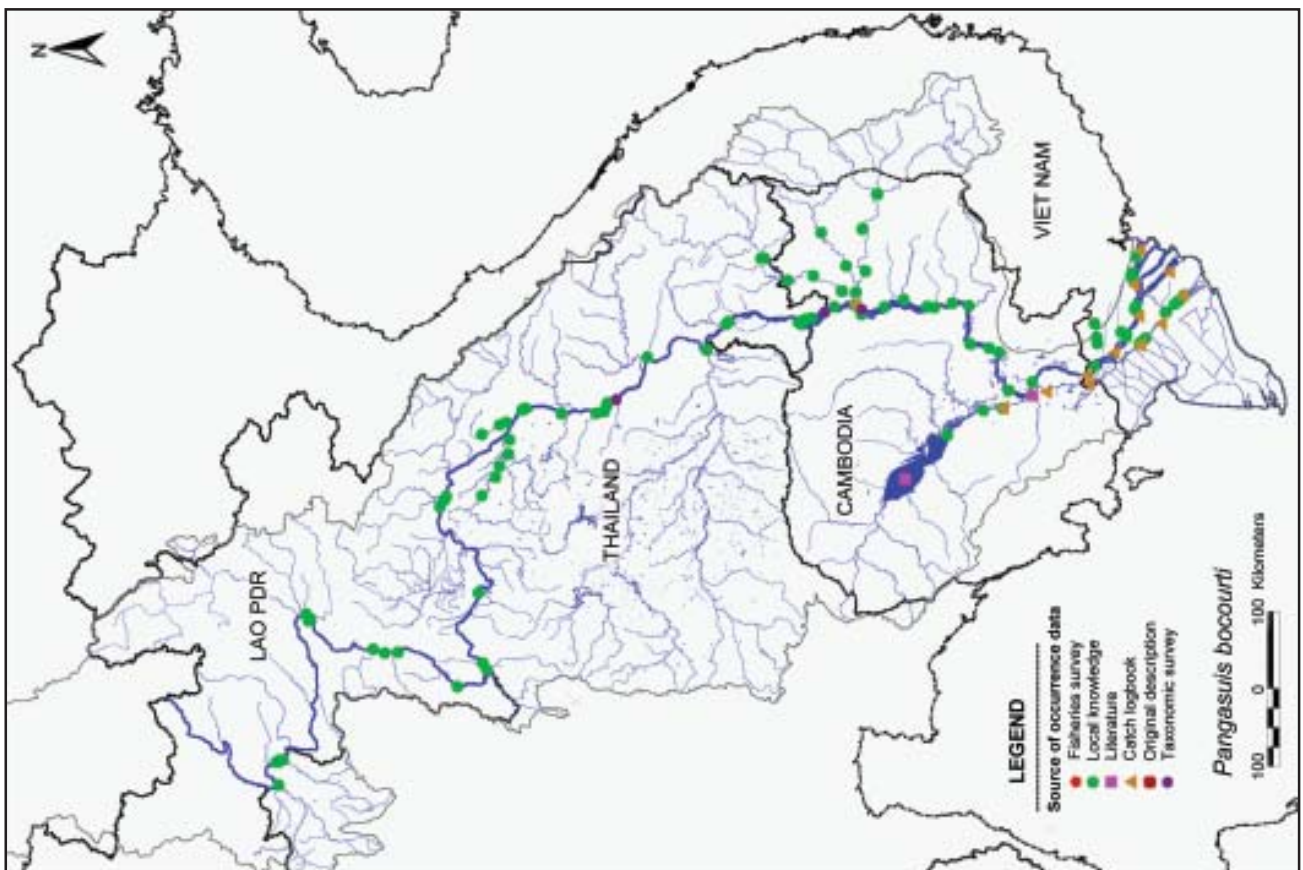
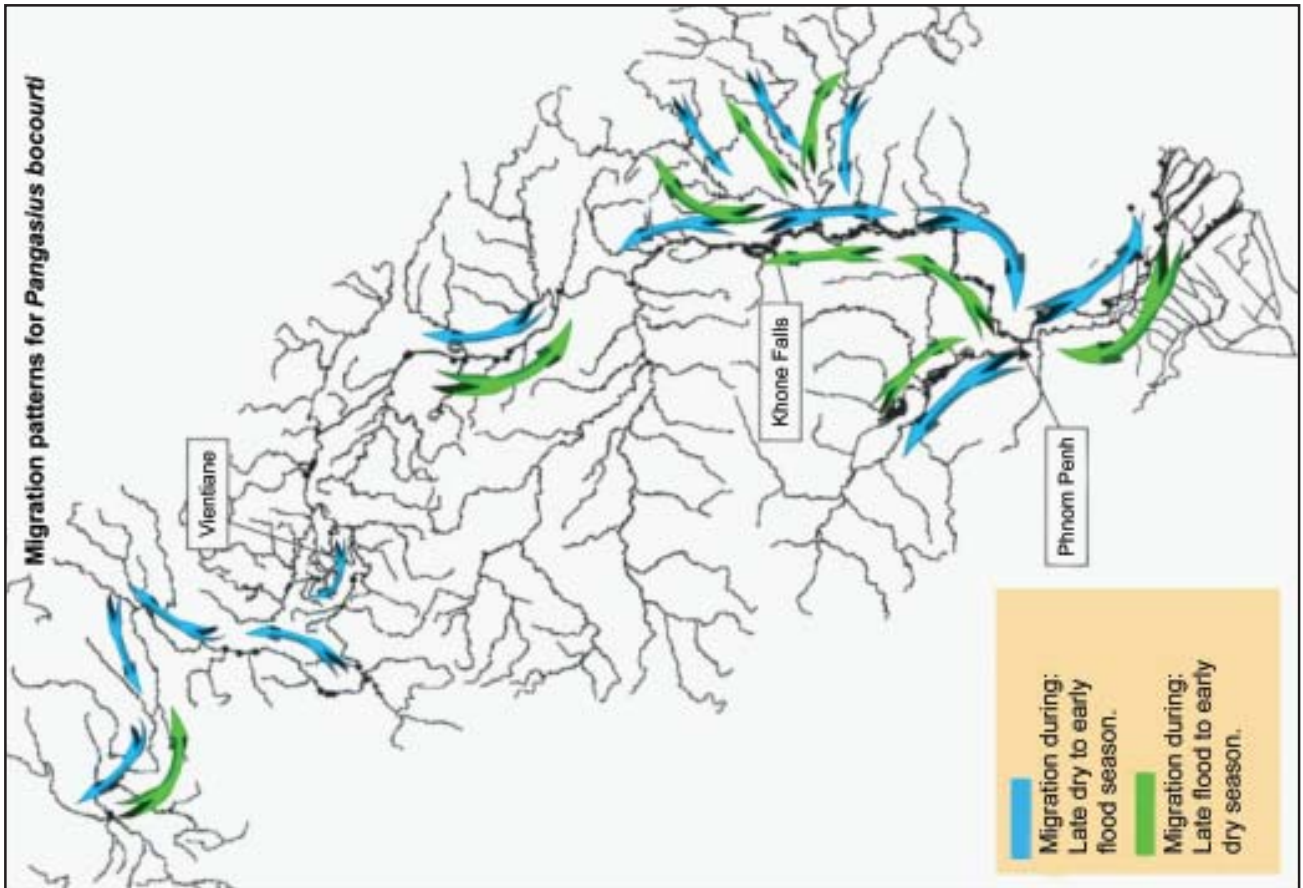
### **Life Cycle**

After spawning in the Mekong mainstream, the hatched larvae drift with the water-flow to their downstream nursery feeding grounds<sup>3</sup>. These are mainly associated with flooded vegetation. When water recedes at the end of the flood season, the young fish move back to the river and start upstream migrations to their dry season refuge habitats<sup>1</sup>. The fish may return to the flooded feeding habitats for two or more seasons. When they reach sexual maturity, the arrival of the monsoon season triggers the fish to migrate upstream to their spawning habitats, where they subsequently spawn, thereby initiating a new cycle.

### **Fisheries**

*Pangasius bocourti* is an important species in the cage culture industry in the Mekong delta of Viet Nam. Until recently, this industry relied completely on the wild capture of larvae and juveniles for stocking into the cages. Nowadays, it can be produced in hatcheries. Therefore, the capture fisheries for juveniles and larvae may disappear, although cage farmers still prefer wild-caught fingerlings.

*P. bocourti* is one of the pangasiid catfishes that migrate over the Khone Falls (Baird, 1998; Singanouvong et al. 1996b) and are caught in large numbers during these migrations. In other places along the river it is caught sporadically, mainly in mainstream gillnet fisheries throughout the basin.



## *Pangasius conchophilus* Roberts & Vidthayanon, 1991



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Sharp-nosed catfish
<b>Khmer:</b>	Trey ke, Trey bra ke
<b>Lao:</b>	Pa phoh, Pa gaa
<b>Thai:</b>	Pla poh, Pla saai yu phueak
<b>Vietnamese:</b>	Ca hu

**World Distribution:** Mekong, and Bang Pakong and Chao Phraya Systems, Thailand.

**Mekong Distribution:** occurs throughout the lower Mekong River Basin. There appears to be one population below Khone Falls and one (or several) above the falls. Found in large rivers (Rainboth 1996), where it inhabits both rapids and deep slow reaches.

**Feeding:** omnivorous with a preference for molluscs – but also feeds occasionally on insects, crabs, algae and forest fruits.

**Size:** 120 cm.

### Population structure

As for many other migrating fish species, *Pangasius conchophilus* is believed to constitute one single population in the lower section, approximately from Pakse in Lao PDR and all the way to the Mekong delta, including the Tonle Sap catchment. It is not possible to reach any conclusions on population structure in the upper section.

### Critical habitats

**Spawning habitats:** believed to spawn at the beginning of the flood season, in the mainstream Mekong in deep areas near rapid pools systems, e.g. from Kratie to Khone Falls, and further upstream, e.g. near the Khemerat rapids.

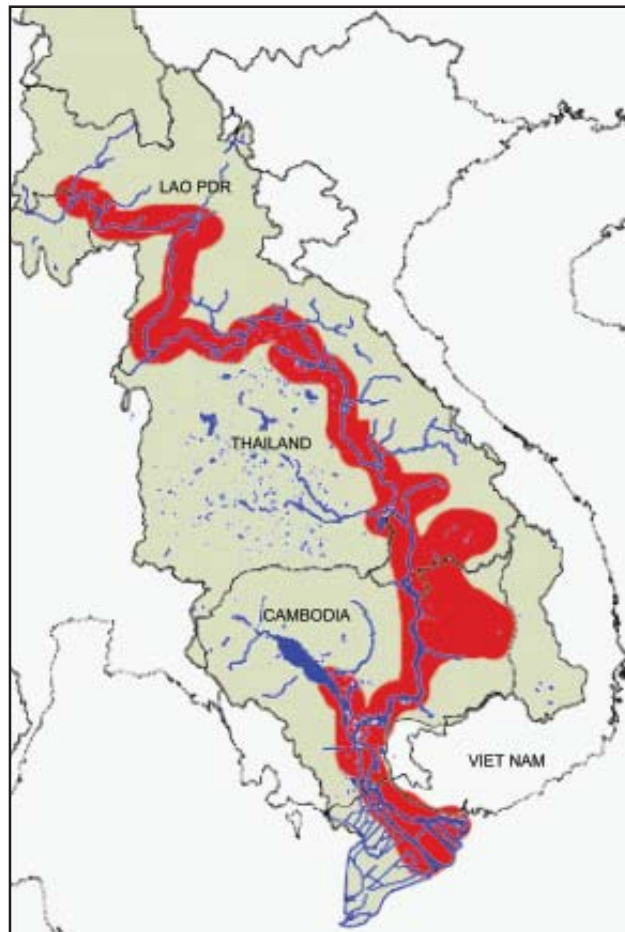
**Feeding habitats:** the young spend their first few months of life feeding and growing on floodplain habitats, particularly on the floodplains of southern Cambodia (including the Tonle Sap system) and the Mekong delta in Viet Nam.

Larger individuals feed mainly on molluscs in the main river channels.

**Refuge habitats:** the large fish seek refuge in deep pools of main river channels during the dry season<sup>1</sup>.

### Life Cycle

*Pangasius conchophilus* spawns at the beginning of the flood season, in the Mekong mainstream somewhere between Kompong Cham and the Khone Falls. When the eggs hatch, the larvae drift downstream until they





are swept out into flood-plain areas in southern Cambodia and Viet Nam<sup>4</sup>. At that time, the current in the Tonle Sap River reverses, resulting in a proportion of the larvae drifting up the Tonle Sap and out into flooded areas along the Tonle Sap River and the Great Lake.

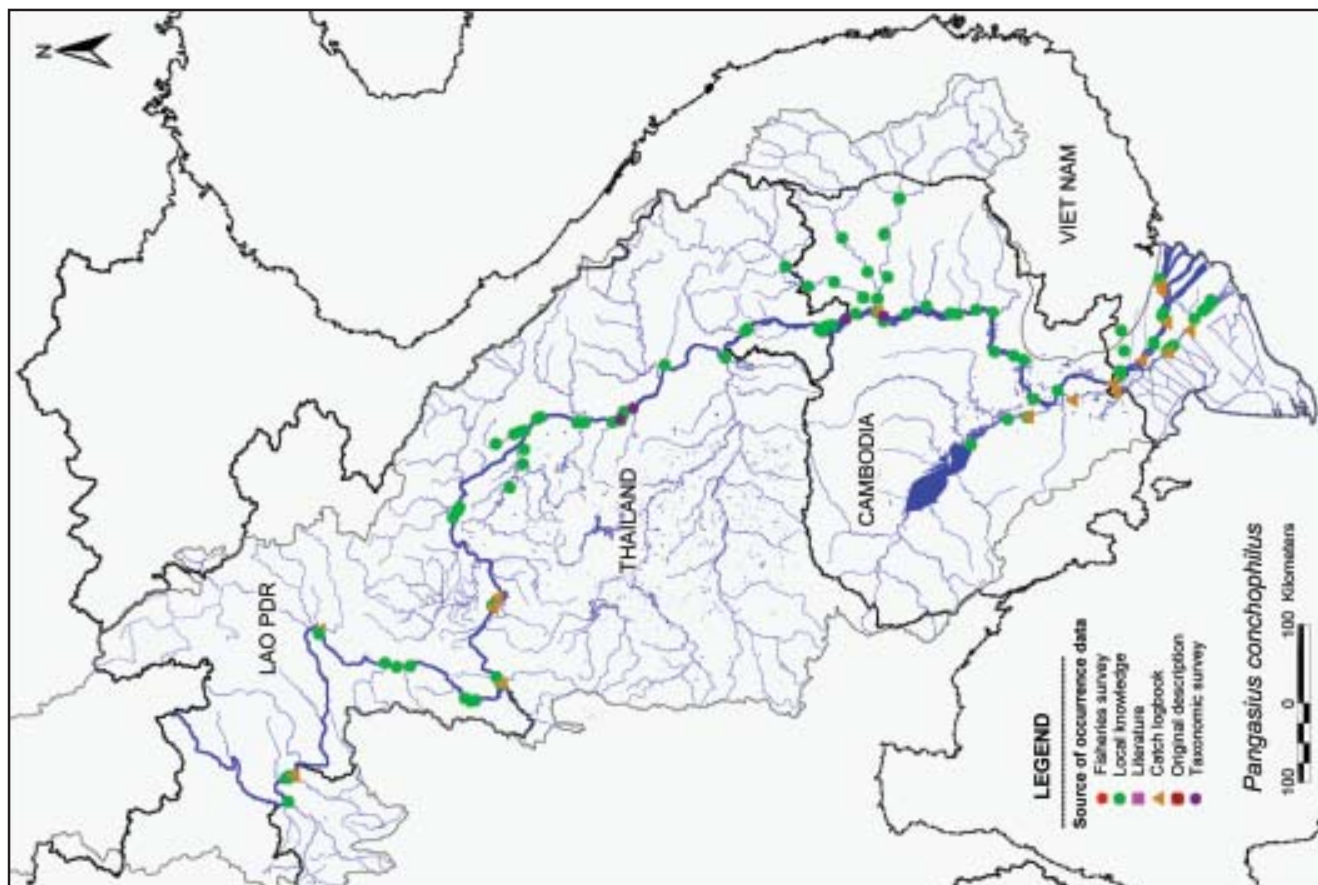
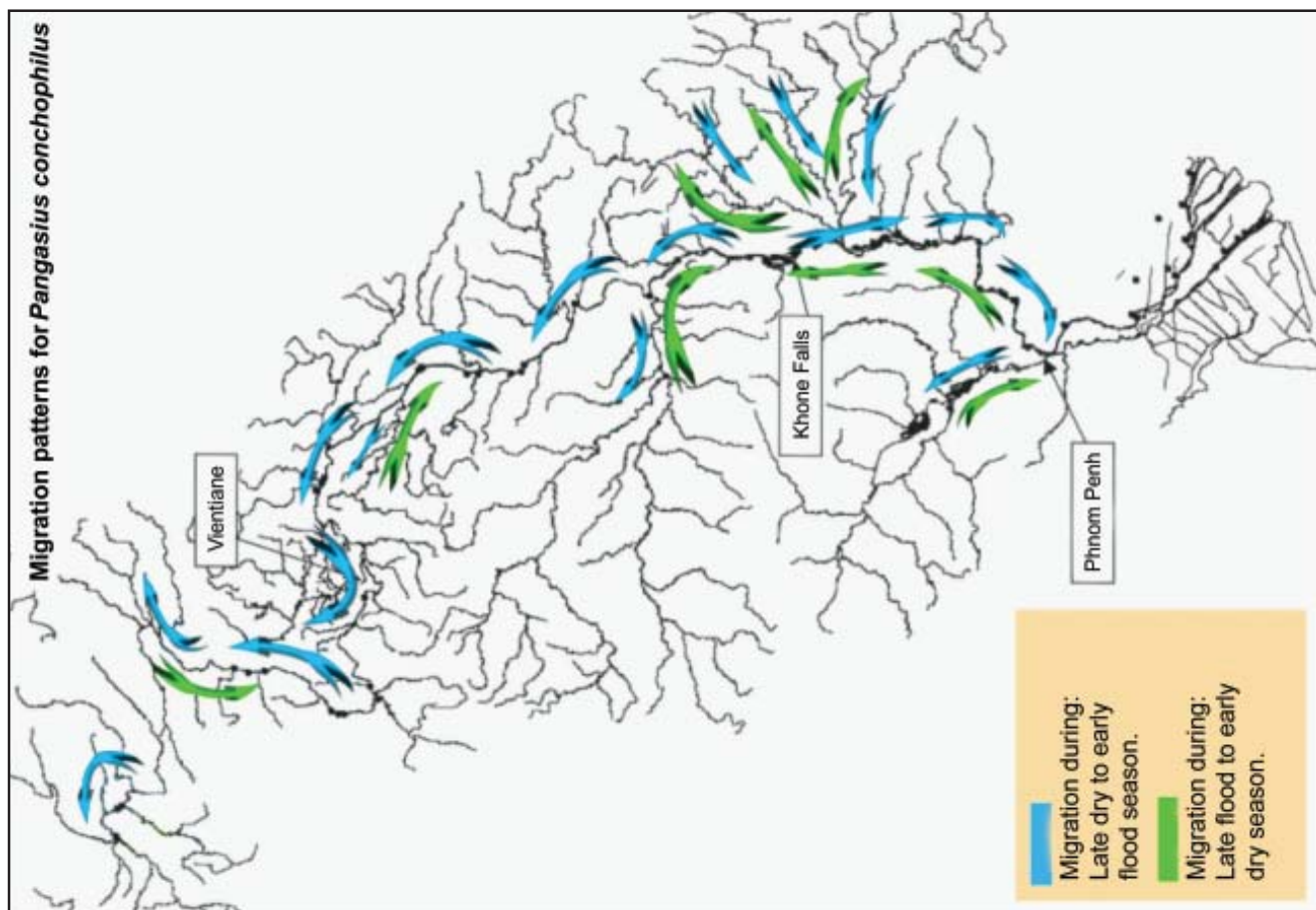
When the water level begins to recede at the end of the monsoon season, the young fish return to the main river and begin a dispersal migration. For the population below the Khone Falls, this dispersal migration takes them all the way from Viet Nam and southern Cambodia to beyond the Khone Falls. In the middle Mekong, movement is from floodplains to deep pools in the mainstream, through large tributaries.

### **Fisheries**

*Pangasius conchophilus* is one of the most important species in certain types of fisheries around the Khone Falls during the early flood season from May to July, and along the entire stretch of the Middle Mekong in the gillnet fisheries (Baird, 1998).

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<sup>1,2,3,4</sup> See page 20 for information on footnotes



## *Pangasius krempfi* Fang & Chaux, 1949



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Krempf's catfish
<b>Khmer:</b>	Trey pra bong lao
<b>Lao:</b>	Pa suey hang leuang
<b>Thai:</b>	Pla suey sor
<b>Vietnamese:</b>	Ca bong lao

**World Distribution:** Mekong, and rivers and coastal waters of southern and eastern Viet Nam.

**Mekong Distribution:** *Pangasius krempfi* occurs basin-wide in the Mekong mainstrea and offshore in the sea.

**Feeding:** the adults feed mainly on fruits, leaves, filamentous algae and crustaceans.

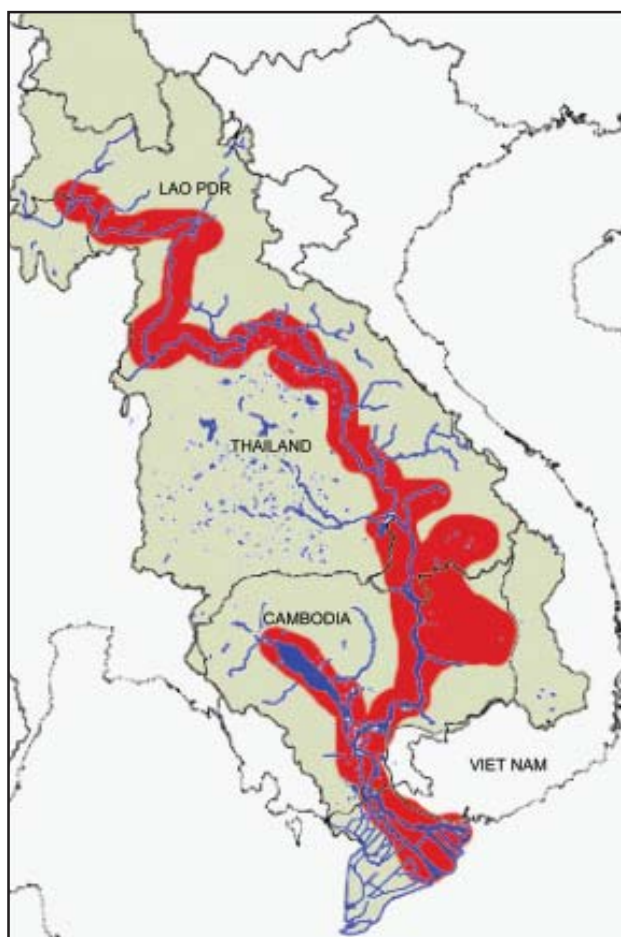
**Size:** about 80 cm.

### Population structure

There may actually be two different species currently classed as *Pangasius krempfi*; one in the middle Mekong and one in the lower Mekong (Rainboth 1996). Alternatively, there might be two populations, an upper and a lower population, both extending into the middle Mekong.

The hypothesised upper population appears to be centred in the upper reaches of the Mekong around Xayaboury and Luang Prabang provinces in Lao PDR.

The hypothesised lower population is the most important from a fisheries perspective. During the early monsoon season at Ban Hang Khone near the Khone Falls, it is one of the most important species in the fisheries (Baird, 1998). It is a transboundary population, which is shared between Viet Nam, Cambodia, Lao PDR and, possibly, Thailand.



### Critical habitats

**Spawning habitats:** it is not known where *Pangasius krempfi* spawns and what its habitat requirements are. However, it can probably be assumed that it spawns in the Mekong mainstream in, or near, rapids-pools systems. Potential sites for the lower population would include the extensive rapids systems near Khemarat, just upstream from the mouth of the Mun River. For the upper population (or species), rapids-pools systems along the stretch upstream from Luang Prabang are potential spawning sites.

**Feeding habitats:** juveniles of the lower population spend the first stage of life in the estuarine zone in the Mekong Delta, frequently moving into salt-water.

**Refuge habitats:** lives in deep pools of the mainstream Mekong (and possibly a few larger tributaries) during the dry season<sup>1</sup>.

## **Life Cycle**

This species is one of very few freshwater fish species of the Mekong, which move into marine habitats at certain periods of their life cycle.

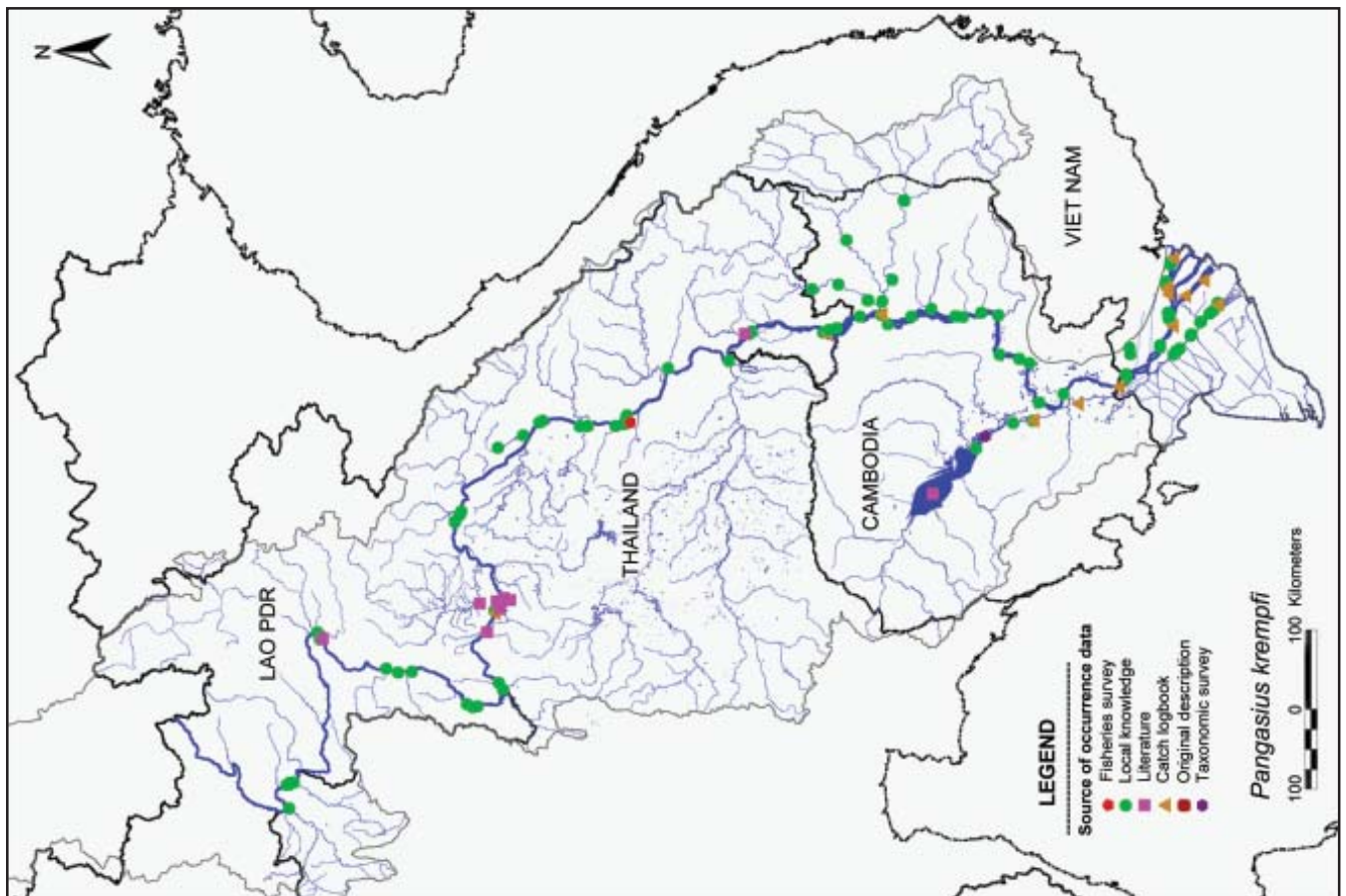
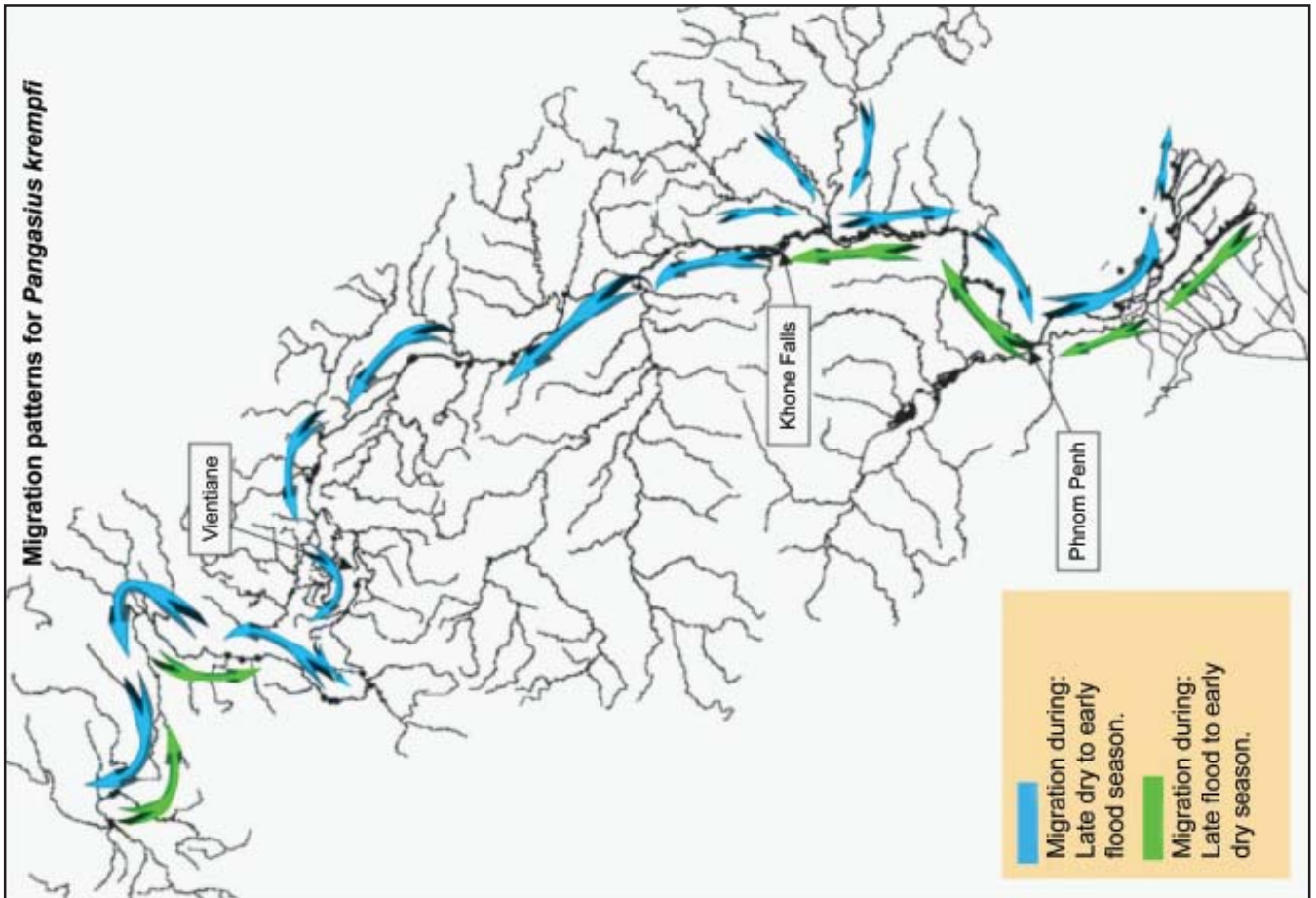
*Pangasius krempfi* probably undertakes one of the longest migrations of all the Mekong species (second only to the Mekong Giant Catfish, *Pangasius gigas*). Although the exact distance is not known, it has been confirmed that the fish migrating over the Khone Falls at the beginning of the monsoon season (May-June), spent part of their early life in the South China Sea (Roberts, 1993b; Roberts and Baird, 1995). *Pangasius krempfi* has been described as an “anadromous fish with a life story resembling that of salmon” (Roberts and Baird, 1995).

Spawning sites may be associated with rapids-pool habitats somewhere in the middle Mekong, for instance near the Khemarat rapids or further upstream. After hatching, the larvae drift downstream. By the time they reach the lower floodplain reaches near Phnom Penh, they are relatively large compared to other species. In the Mekong delta, the young spend part of their early juvenile stages in the South China Sea. When they reach a certain size, they move into freshwater again and eventually migrate upstream to near the Khone Falls. When mature, they migrate over the Khone Falls toward their spawning grounds further upstream, where they spawn at the beginning of the monsoon.

A similar life cycle is expected for the upper population, although it probably does not have a marine stage. The upstream spawning migrations occur several times in pulses of 3-5 days duration. Downstream movements of large fish have also been observed but these are much less conspicuous and, unlike upstream migrations, are not undertaken in big schools within short peak periods.

## **Fisheries**

*Pangasius krempfi* is one of the most important fish in certain types of fisheries around the Khone Falls during its upstream migration from May to July (Baird, 1998). It is caught regularly during its migration period in gillnet fisheries along most of the middle Mekong. It is also an important fish in the fisheries of the Mekong Delta, and is caught occasionally in the South China Sea.



## *Pangasius mekongensis* Gustiano, Teugels and Pouyaud, 2003



**Family:** Pangasiidae (Shark catfishes)  
**English:** Yellow-finned catfish  
**Khmer:**  
**Lao:** Pa nyang; Pa hua muam  
**Thai:**  
**Vietnamese:** Ca tra kunit

**World Distribution:** Southeast Asia, including Indochina, Malaysia, western Indonesia and Borneo.

**Mekong Distribution:** occurs throughout the lower Mekong basin, but is relatively rare. It is most common from Nakhon Phanom in the North to Kandal Province (Cambodia) in the south. In Lao PDR and Thailand its presence is limited to a few months every year.

**Feeding:** omnivorous – mainly insects, worms, submerged plants and seeds.

**Size:** up to 90 cm.

### Population structure

It has been hypothesised that there are several distinct populations of *Pangasius mekongensis*. One population is distributed within the area between Loei and Chiang Khong, and there may be one or two distinct populations in the remainder of the Lao PDR, Thailand and Cambodia. Each population focuses around a major tributary, e.g. the Mun River. If there is more than one population along this stretch, a substantial degree of overlap may be expected.

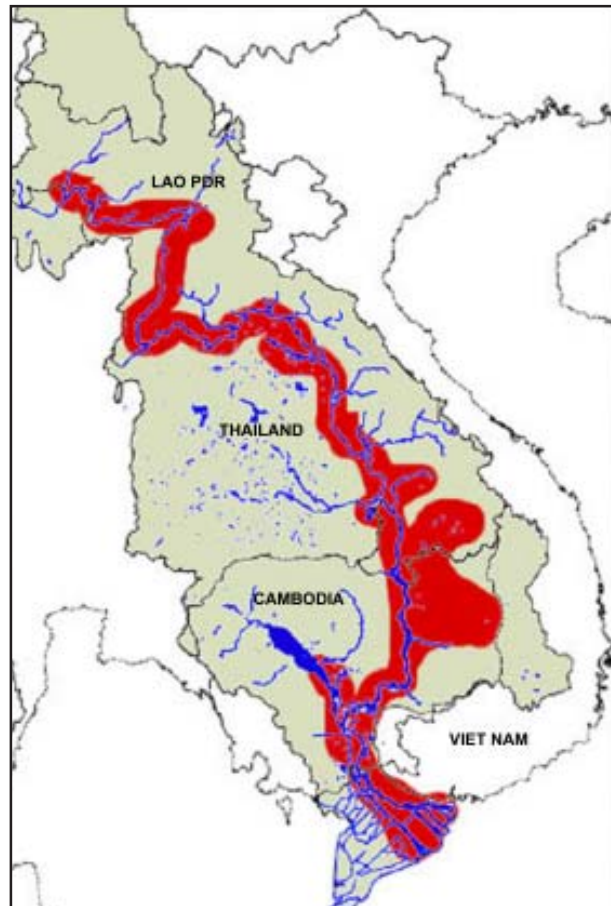
Finally, there may be a distinct population south of the Khone Falls that spawns in the Se San tributary system. Adults and juveniles (including larvae) migrate downstream to areas with more extensive floodplains below Kratie.

### Critical habitats

**Spawning habitats:** spawning occurs in the Mekong mainstream. No information is available on exact spawning location and behaviour. Larvae of the species can be caught in the drift in the Mekong and Bassac rivers in Viet Nam. These larvae are believed to originate from spawning grounds far upstream, i.e. beyond the Khone Falls.

**Feeding habitats:** juveniles and sub-adults use flooded areas as nursery and feeding habitats and mainly feed on plant material. The juveniles are mainly seen in the lower reaches of the river, in the tidal zone of the Mekong delta<sup>1</sup>. Large individuals stay in the main river channels, where they feed on a range of food items.

**Refuge habitats,** *Pangasius mekongensis* spend the dry season in deep pool refuges in the Mekong mainstream<sup>1</sup>.



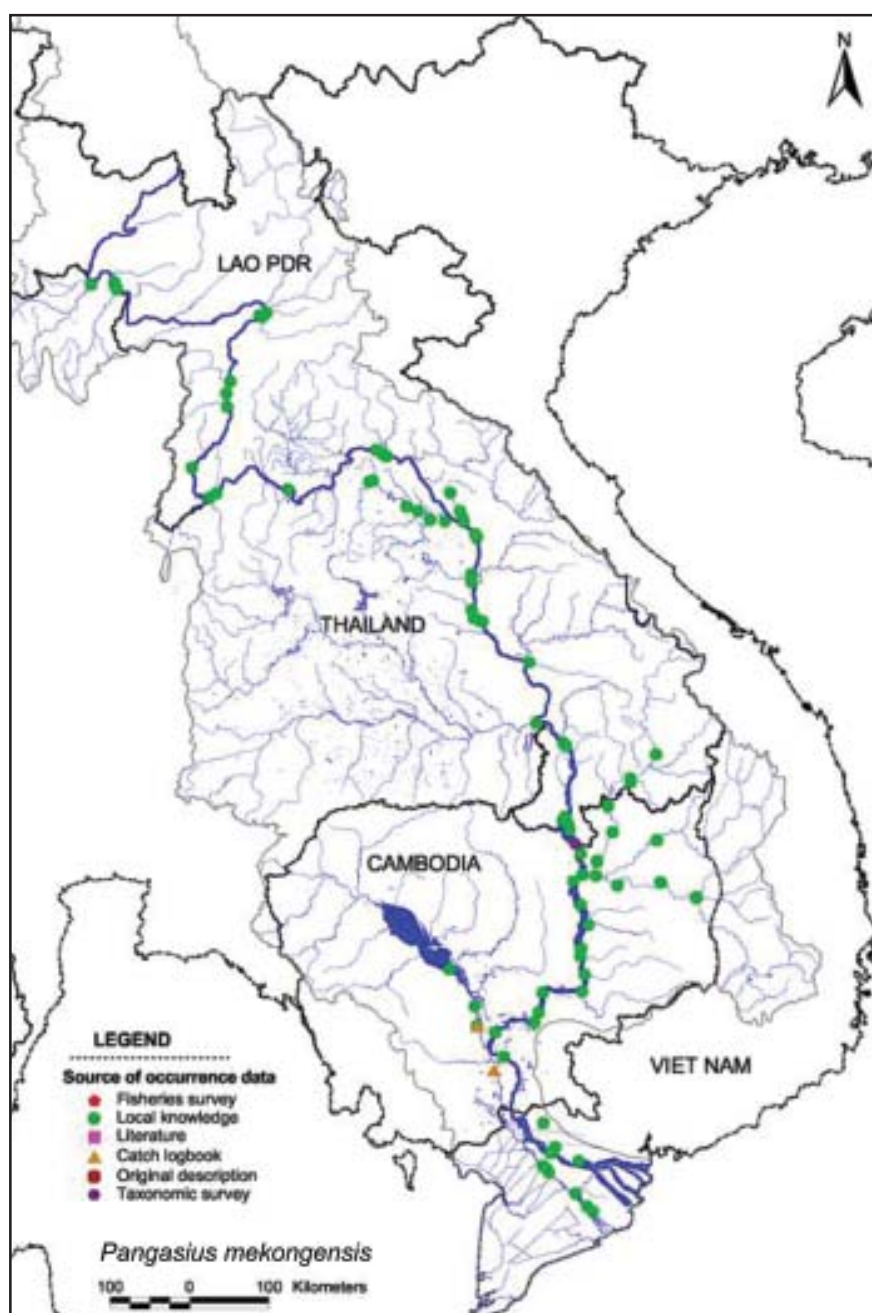
## Life Cycle

After spawning in the Mekong mainstream, the hatched larvae drift with the water-flow to their downstream nursery feeding ground. These are mainly associated with flooded vegetation during the flood season.

When water recedes at the end of the flood season, the young fish move back to the river and start upstream migrations to their dry season refuge habitats<sup>1</sup>. The fish may return to the flooded feeding habitats for two or more seasons. When they reach sexual maturity, the arrival of the monsoon season triggers the fish to migrate upstream to their spawning habitats, where they subsequently spawn, thereby initiating a new cycle.

## Fisheries

This is a rare species and of little general significance in fisheries. However, it is caught regularly in Viet Nam and Cambodia.



## *Pangasius larnaudii* Bocourt, 1866



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Black-spotted catfish
<b>Khmer:</b>	Trey Por
<b>Lao:</b>	Pa peung, Pa Humad
<b>Thai:</b>	Pla tay pho
<b>Vietnamese:</b>	Ca vo dem

**World Distribution:** Mekong, and Chao Phraya System, Thailand.

**Mekong Distribution:** Occurs basin-wide in large rivers and floodplains.

**Feeding:** omnivorous, with one of the largest ranges of foods of all pangasiids.

**Size:** up to 150 cm, more commonly 90-100 cm.

### Population structure

As for many other migrating fish species, *Pangasius larnaudii* is believed to constitute one single population in the lower section, approximately from Pakse in Lao PDR and all the way to the Mekong delta, including the Tonle Sap catchment.

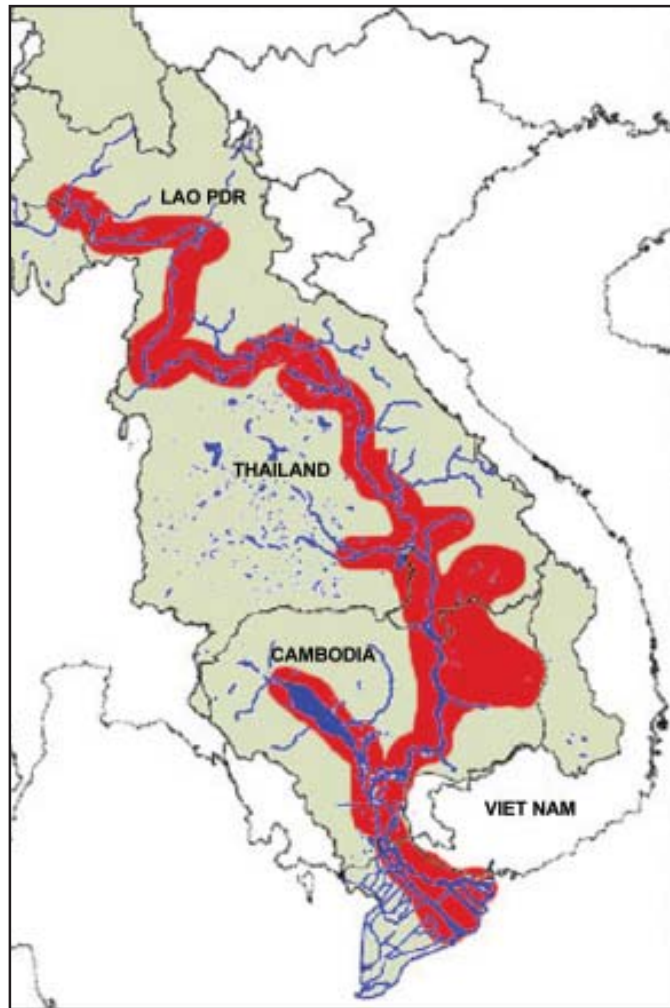
The population structure further upstream is unknown.

### Critical Habitats

*Spawning habitats:* different suggestions have been made regarding the spawning habitats of *Pangasius larnaudii*. Rainboth (1996) suggested that it spawns in floodplains at the beginning of the flood season, whereas Bardach (1959) suggested that it spawns in the Mekong River near Stung Treng and larvae take 6-8 days to reach the Bassac River in southern Lao PDR. Since the fish migrating over the Khone Falls at the beginning of the dry season are in spawning condition, spawning grounds somewhere above the Khone Falls are also likely.

*Feeding habitats:* the young fish enter floodplain habitats, where they feed during the flood season.

*Refuge habitats:* the species spends the dry season in deep pools in the Mekong mainstream, e.g. along the Kratie – Stung Treng reach<sup>1</sup>.



<sup>1,2,3,4</sup> See page 20 for information on footnotes



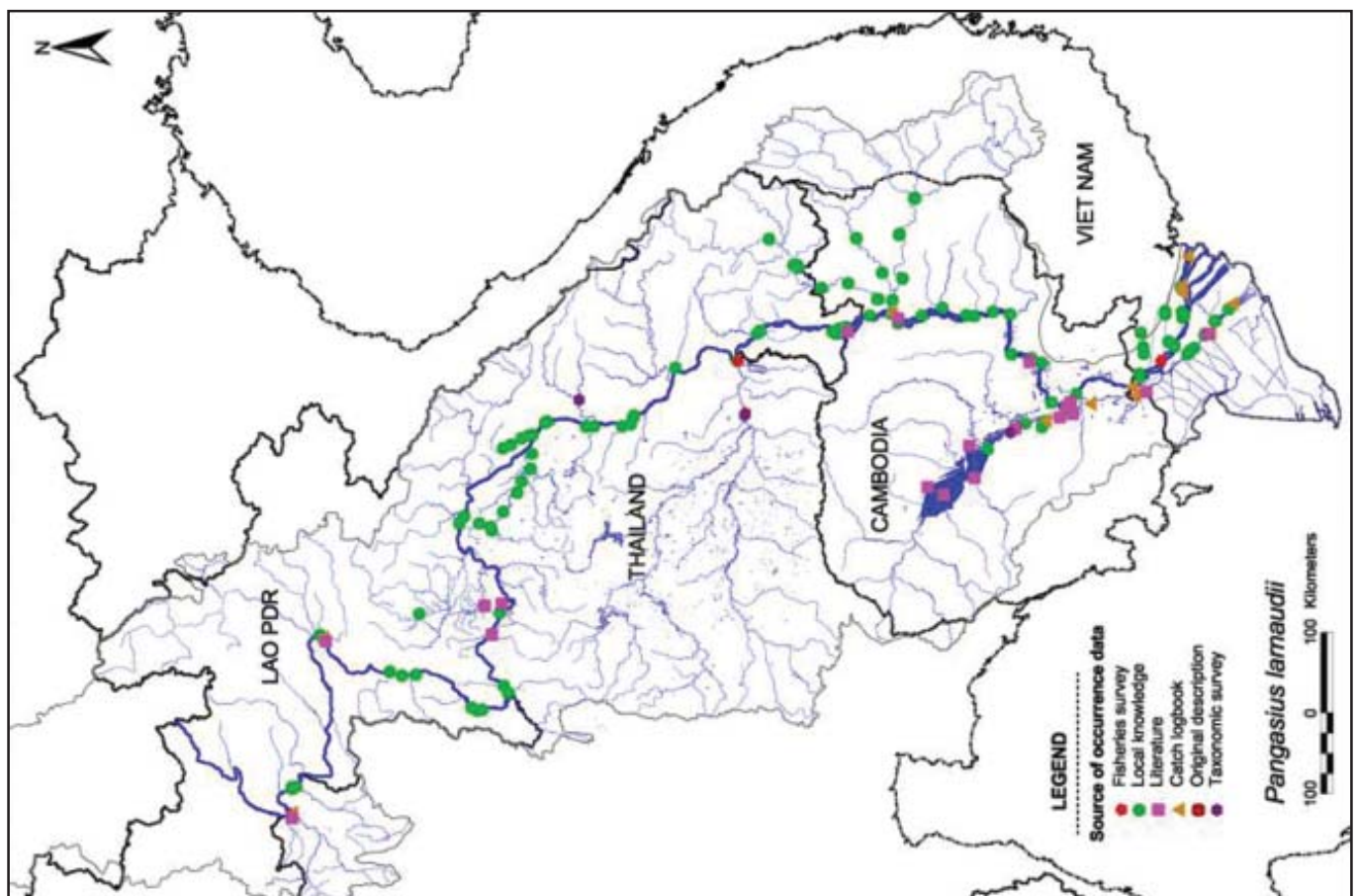
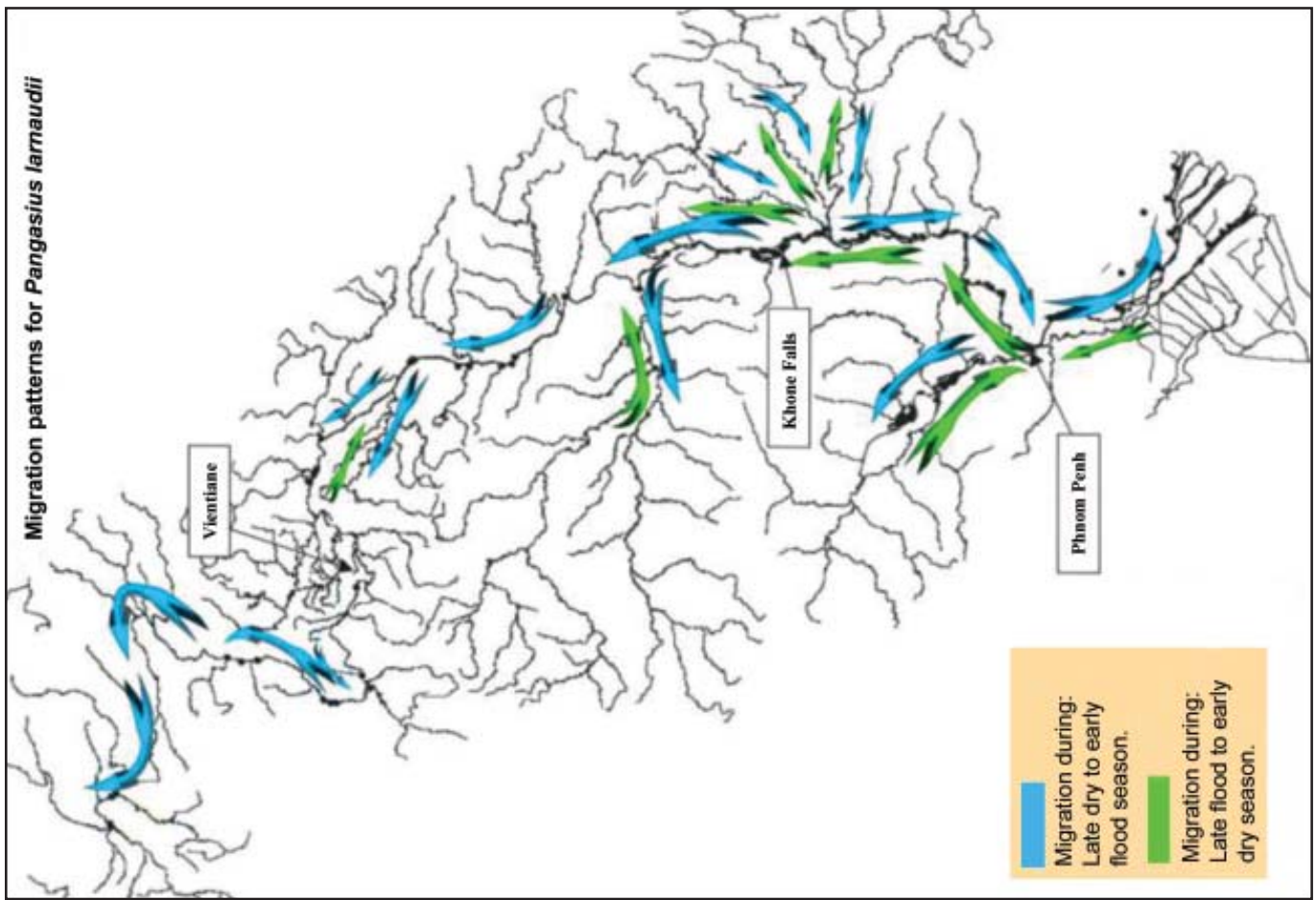
## Life Cycle

*Pangasius larnaudii* spawns at the beginning of the monsoon season (May-July) and larvae enter floodplain habitats where they grow during the flood season. Both juveniles and adults return to the Mekong River when water levels start to recede at the end of the monsoon season. Some of the bigger individuals, especially in the upper sections of the Mekong, may remain in the main channel during the monsoon season.

The species then migrates towards deep pools where they spend the dry season<sup>1</sup>. The reach from the Khone Falls to Kompong Cham in Cambodia constitutes a particularly important dry-season habitat<sup>1</sup>. When the fish are sexually mature they undertake upstream spawning migrations from refuge habitats to spawning habitats at the beginning of the monsoon season<sup>1</sup>, (Baird (1998), Singanouvong, et al. 1996). These migrations normally occur just after the upstream migration of *Pangasius krempfi*<sup>1</sup>. *Pangasius larnaudii* is one of the few species of the pangasiid family that can be seen near the water surface<sup>1</sup>, a fact that makes the species easier to target for fishers along the river.

## Fisheries

Together with *Pangasius conchophilus*, this species is the most important in the wet season fishery (May to June) during its migration through Hoo Som Yai, a steep-gradient channel at the fault line of the Khone Falls (Singanouvong et al. 1996b). Unlike *P. conchophilus*, however, these upstream migrations by *P. larnaudii* are more protracted, with regular smaller movements taking place over a number of weeks. Singanouvong et al. (1996b) considered the purpose of the migrations to be reproduction. In the *tone* trap and *lee* trap fisheries at Ban Hang Khone (Khone Falls), *P. larnaudii* ranked third after *P. conchophilus* and *P. krempfi* (Baird, 1998). It is important throughout its range, particularly in Cambodia.



## *Pangasius pleurotaenia* Sauvage, 1878



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Red-finned catfish
<b>Khmer:</b>	Trey Chhwiet
<b>Lao:</b>	Pa nyon thong khaom
<b>Thai:</b>	Sang ka wart tong kom, Yon peek
<b>Vietnamese:</b>	Ca sat bay

**World Distribution:** Mekong, and Chao Phraya, Mae Klong and Tapi Systems, Thailand.

**Mekong Distribution:** occurs throughout the lower Mekong basin but is most common in the Middle Mekong (Rainboth, 1996), rare both in the far north and far south, in large and medium-sized rivers.

**Feeding:** omnivorous - feeds on aquatic insects, plant material, fruits and flowers of certain brushes. It relies on its vision for catching its prey and therefore prefers clearer water. This also explains its relatively large eyes. Many fishermen from Lao PDR and

**Size:** up to 30 cm, commonly 20-25 cm.

Population structure

Many populations may occur in the middle Mekong, where the species is most common.

### Critical habitats

*Spawning habitat;* it is not possible to conclude anything on spawning habitat and behaviour based on current information.

*Feeding habitat;* larvae and juveniles are expected to feed on floodplain habitats in the lower section of the basin. Adults feed in the main river channels, e.g. on insects<sup>1</sup>.

*Refuge habitats:* reportedly spends the dry season in deep pool refuge habitats<sup>1</sup>.

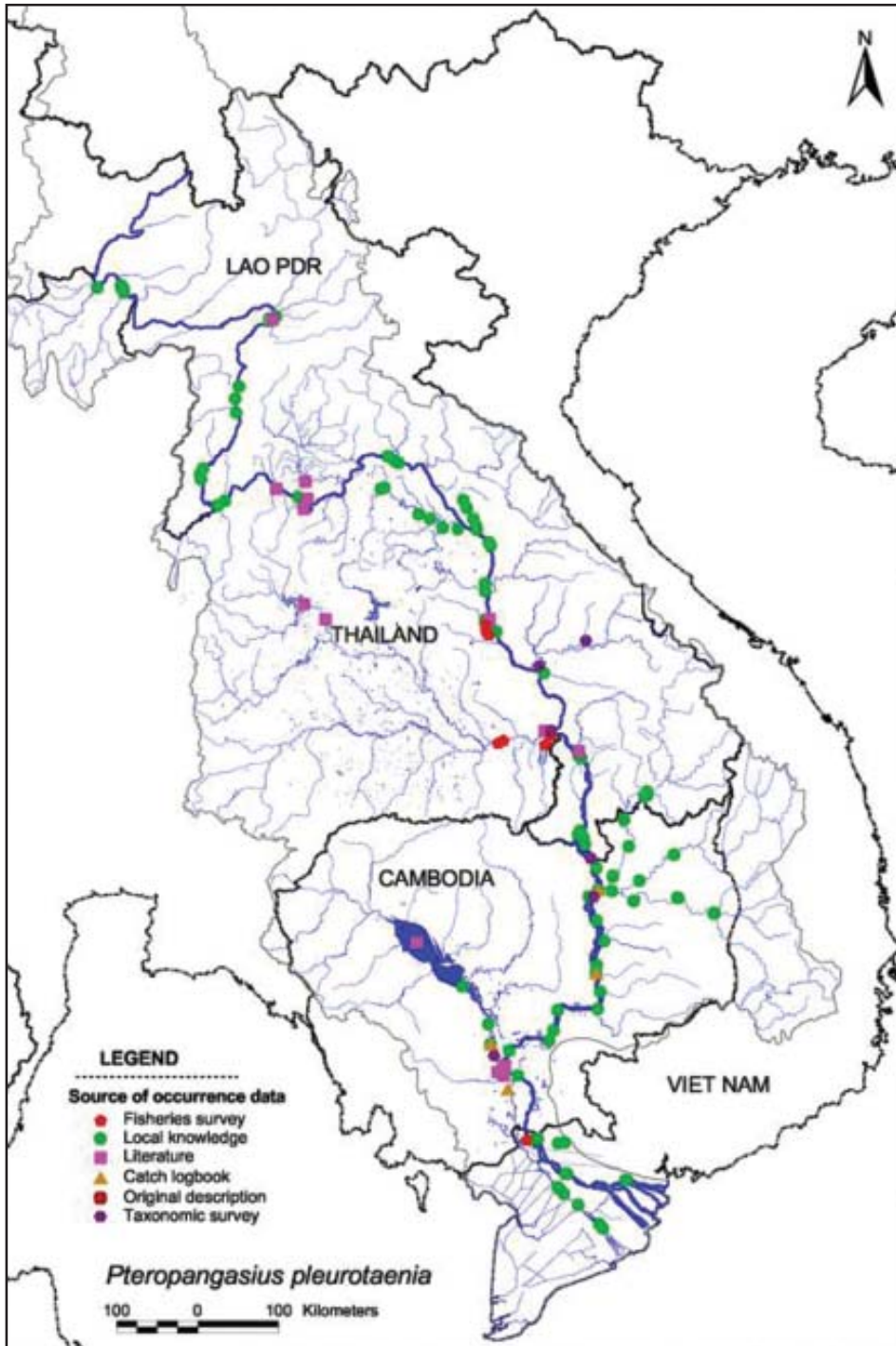
### Life Cycle

After spawning, which occurs during may-June, larvae drift downstream to nursery habitats, e.g. the extensive floodplains of the lower basin. At the beginning of the dry season, the young fish migrate back to the main river channel, where they start migrating upstream towards their dry season deep pool habitats. When the next monsoon sets in, they are believed to migrate upstream to their spawning habitat. The first heavy rains, which occur at the end of the dry season, trigger *Pangasius pleurotaenia* to migrate upstream. From the Khone Falls to Loei province in Thailand, the migration occurs over a relatively short period during May-June. Further upstream, from Xayaboury to Chiang Rai, the migrations tend to take place over a longer period, from March to August. Spawning is reported to occur in small tributaries.



### Fisheries

*Pangasius pleurotaenia* has previously been identified in the *tone* trap fishery at the Khone Falls, which targets highly migratory small cyprinids during the dry season from January to March (Baird, 1998). Singanouvong et al. 1996b also sampled the species during the flood season over a three-year period and found that most migratory activity took place when the water flow volume was increasing rapidly. That increase occurred within a short time span, from early to mid-June in all three years. It is also fairly abundant in the *dai* fishery of Tonle Sap River (Lieng et al., 1995).



## *Pangasius elongatus* Pouyaud, Gustiano and Teugels, 2002



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Elongate catfish
<b>Khmer:</b>	Trey chhwiet
<b>Lao:</b>	Pa nyon hang hian
<b>Thai:</b>	Pla sang ka wang
<b>Vietnamese:</b>	Ca dua

**World Distribution:** Mekong, and Chao Phraya System, Thailand. Formerly combined with *P. polyuranodon*, which does not occur in the Mekong.

**Mekong Distribution:** occurs from the Mekong delta in Viet Nam to Xayaboury in the Lao PDR. However, it is extremely rare in the middle Mekong (i.e. from the Khone Falls and upstream). Normally found in the lower courses of major and deep rivers (Rainboth 1996).

**Feeding:** omnivorous - mainly aquatic insects, submerged plants, fruits, leaves, worms molluscs and crustaceans.

**Size:** up to 100 cm, more commonly 40 cm.

### Population structure

There is no available information on the population structure of this species.

### Critical habitats

*Spawning habitats:* unknown.

*Feeding habitats:* mainly feeds on floodplains during the monsoon season.

*Refuge habitats:* spends the dry season in deep pools of the Mekong mainstream<sup>1</sup> and, possibly, larger tributaries.

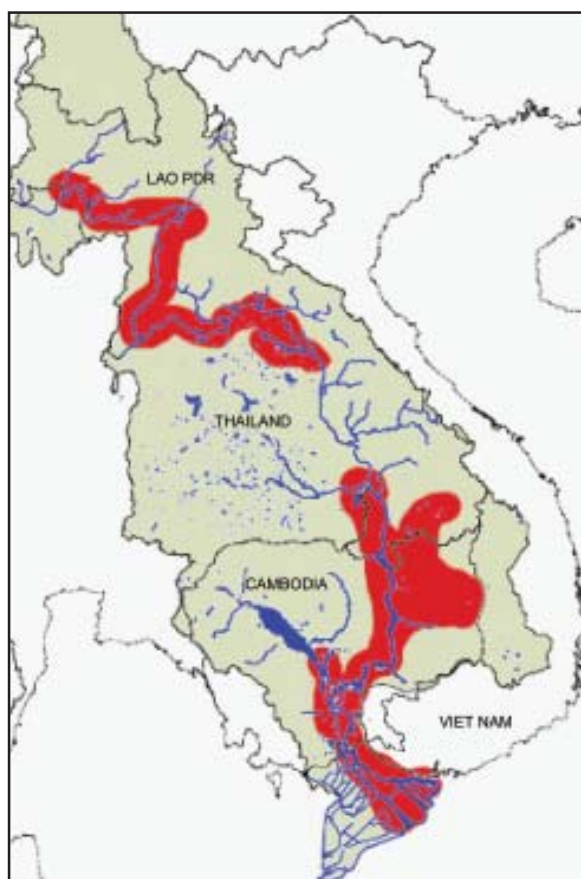
### Life Cycle

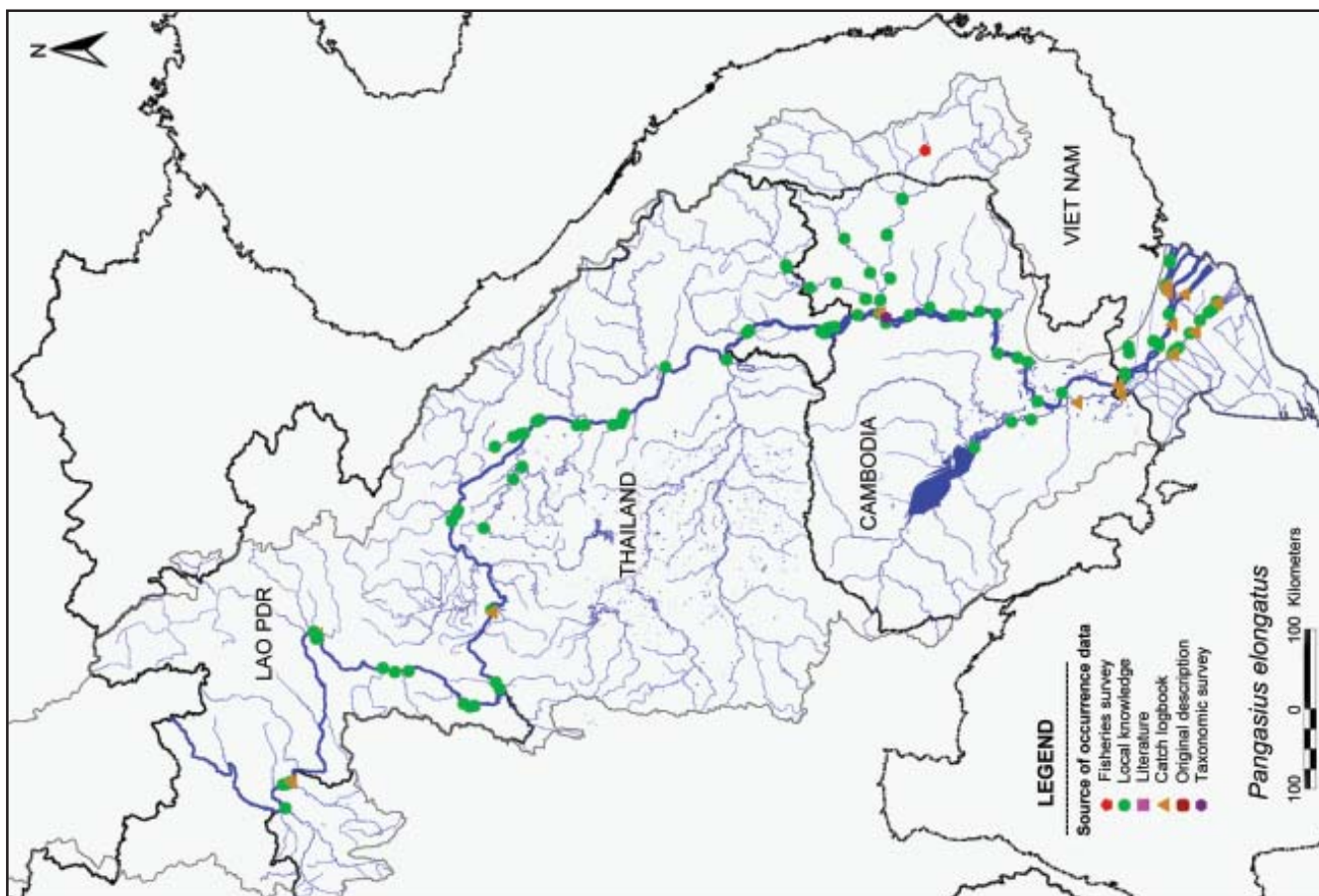
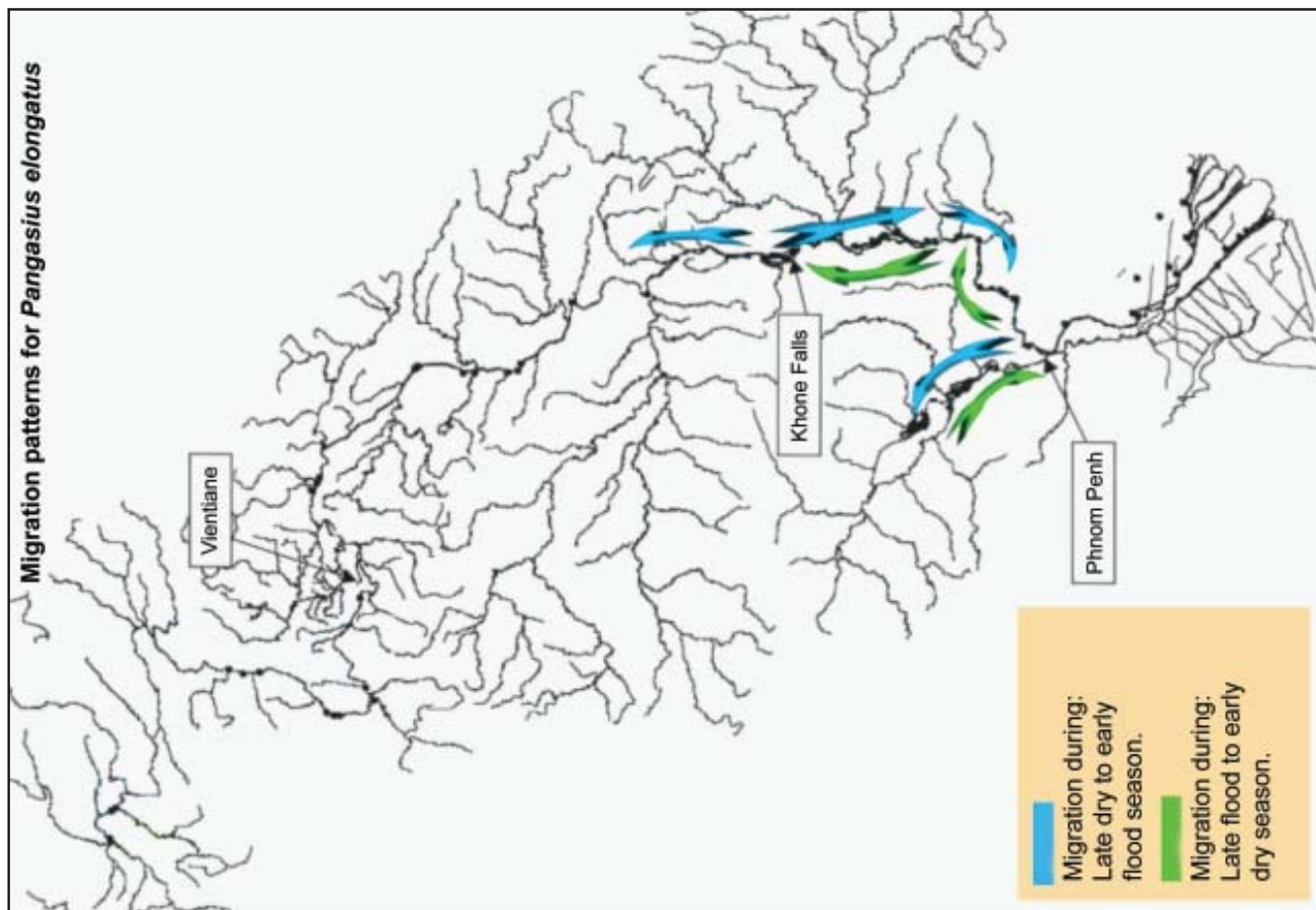
After spawning in the Mekong mainstream, the hatched larvae drift with the water-flow to their downstream nursery feeding ground. These are mainly associated with flooded vegetation during the flood season.

When water recedes at the end of the flood season, the young fish move back to the river and start upstream migrations to their dry season refuge habitats<sup>1</sup>. The fish may return to the flooded feeding habitats for two or more seasons. When they reach sexual maturity, the arrival of the monsoon season triggers the fish to migrate upstream to their spawning habitats, where they subsequently spawn, thereby initiating a new cycle.

### Fisheries

*Pangasius elongatus* between 20 and 345 g in weight have previously been reported in the dry season gillnet fisheries at Ban Hang Khone (Baird, 1998), just below the Khone Falls, during December-February. Several specimens have been reported in the *tone* fishery during the beginning of flood season (Baird, 1998). It is caught regularly throughout its range. Along certain stretches of the Mekong, fishers using floating hooks baited with fruit of the tree *Cayratia trifolia* exploit its fruit-eating habits.





## *Pangasius macronema* Bleeker, 1851



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Long-barbel catfish
<b>Khmer:</b>	Trey chhwiet
<b>Lao:</b>	Pa yawn
<b>Thai:</b>	Pla yon keow
<b>Vietnamese:</b>	Ca tra sinh

**World Distribution:** Mekong, Chao Phraya, Thailand, south to Java and southern Borneo.

**Mekong Distribution:** occurs basin-wide.

**Feeding:** a visual feeder on aquatic insects, worms, detritus, fruits and other plant material.

**Size:** up to 35 cm, mature at 13 cm.

### Population structure

Three populations of *Pangasius macronema* exist.

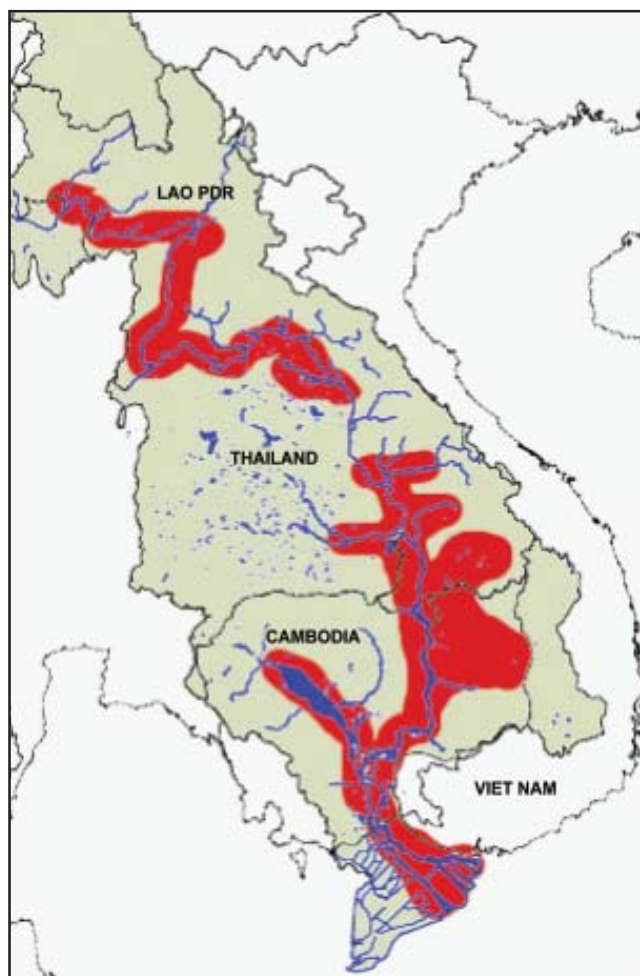
The distribution range of the first population is from Thakhek, Khammouan province of the Lao PDR to Chiang Saen, in Chiang Rai province of Thailand. This population migrates upstream during May-June at the onset of the flood period, to spawn in the upper reaches of the Mekong River. After spawning, adults and juveniles spread out through the area.

The second population is distributed from Khemmaratch, Ubon Ratchathani province of Thailand in the north, down to Kratie province in Cambodia. This population breeds above the Khone Falls. After spawning, juveniles and adult fish disperse throughout the area. When the water level starts decreasing in November, *Pangasius macronema* migrates to some of the deep pools (e.g., near Kratie), where it stays until the next flood.

The third population partly overlaps with the second. It is distributed from Stung Treng in Cambodia, down to the Bassac River in Can Tho province and to the Mekong Delta. This population spawns in the area around Quatre Bras at the confluence of the Tonle Sap and Mekong rivers. These fish migrate to, and remain in, the same area as the second population during the dry season.

### Critical habitats

*Spawning habitats:* spawns in the Mekong mainstream. Exact spawning grounds and habitat requirements are not known. Since larvae of the species have been identified in drift samples from both Mekong and Bassac rivers in Viet Nam, spawning is believed to take place far upstream, possibly beyond the Khone Falls, and/or in the Sesan tributary system.



*Feeding habitats:* larvae and juveniles feed in floodplain habitats, e.g. in Southern Cambodia and Viet Nam. Adults feed mainly in large rivers near the surface, often relying on vision to capture their prey, which include dragonflies.

*Refuge habitats:* spends the dry season in deep pool refuge habitats in the Mekong mainstream<sup>1</sup>, and possibly some of the larger tributaries.

### **Life Cycle**

*Pangasius macronema* spawns in large schools in the Mekong mainstream during the flood season, possibly later than most other pangasiid species<sup>1</sup>. Both juveniles and adults enter floodplain habitats to feed. At the beginning of the dry season, they move back to the river channels and migrate towards their dry-season habitats associated with deep pools.

Although migrations of the species may be triggered by changes in water level and quality, many fishers have also noted that high abundance of this species often coincides with high abundance of certain aquatic insects, in particular, dragonflies.

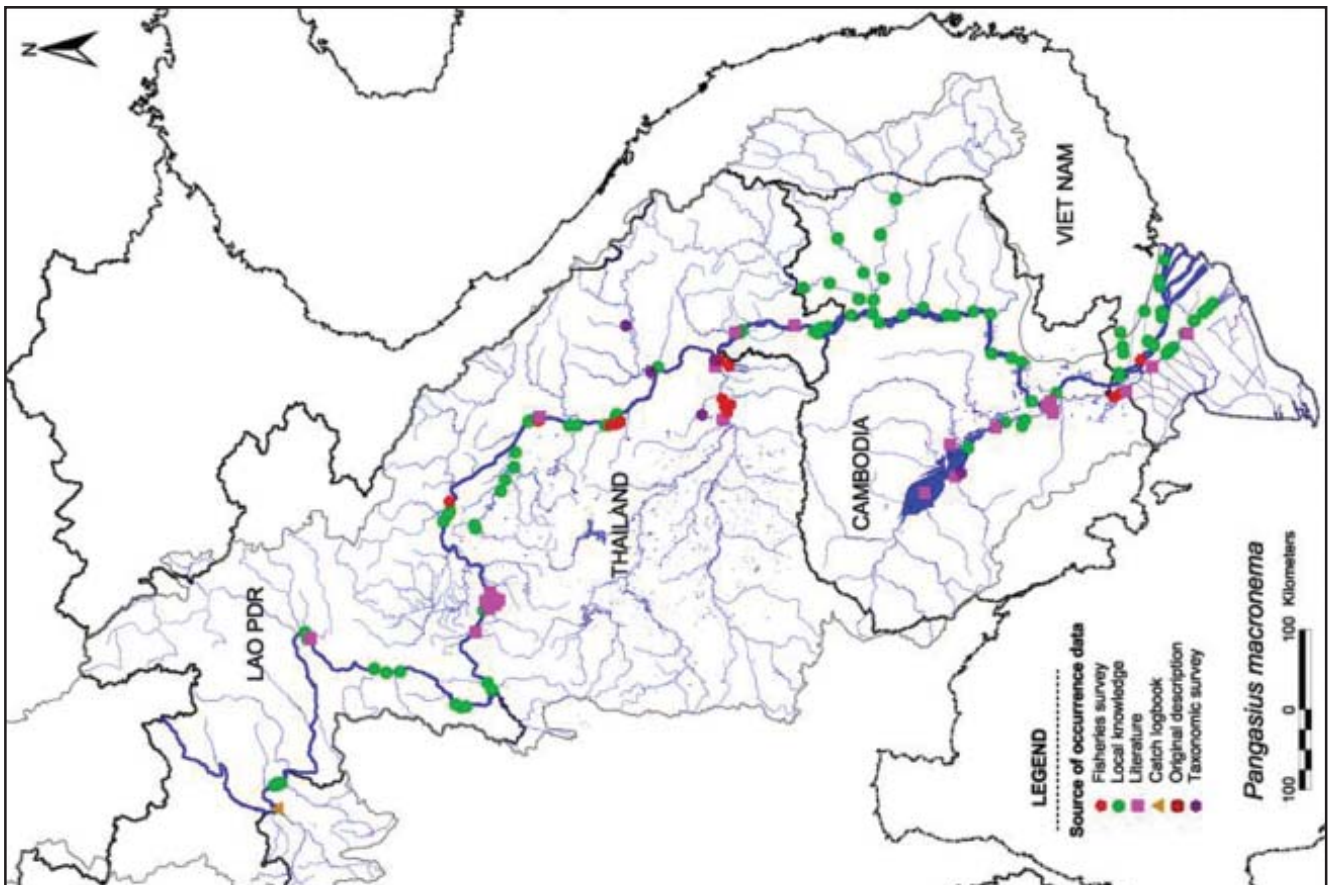
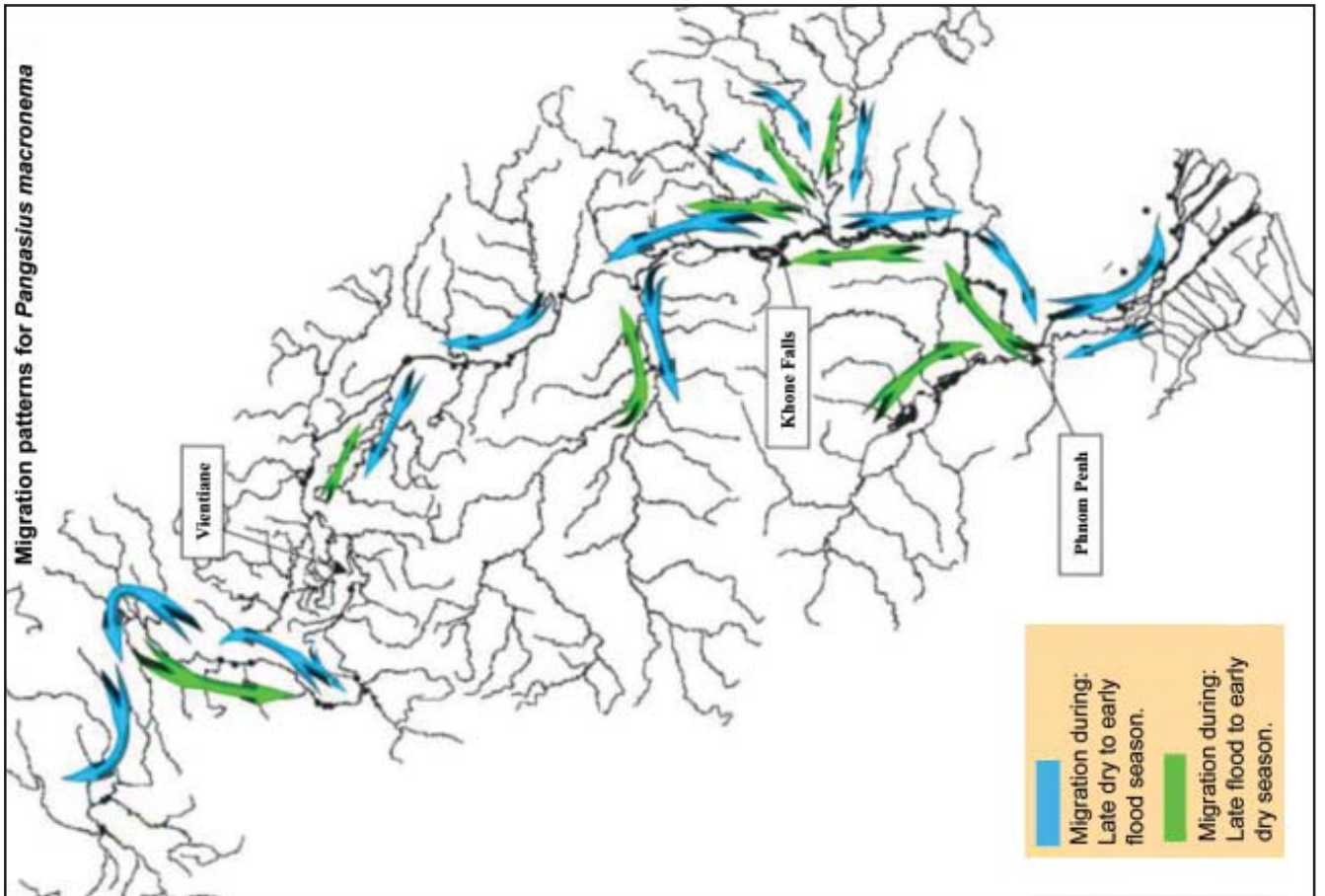
### **Fisheries**

The seasonal migration of *Pangasius macronema* over the Khone Falls in southern Lao PDR creates the foundation for an important fishery in that area. During the period from April to June, the species migrates over the falls through one particular channel, the Hou Sahong. During this period in 1998, the catch from fishers from the nearby village of Hang Sadam was estimated at a total of 4,000 kg (Baird et al. 2000).

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<sup>1,2,3,4</sup> See page 20 for information on footnotes





## *Pangasius sanitwongsei* Smith, 1931



<b>Family:</b>	Pangasiidae (Shark catfishes)
<b>English:</b>	Giant catfish
<b>Khmer:</b>	Po Pruy
<b>Lao:</b>	Pa leum, Pa ling
<b>Thai:</b>	Tepa, Lerm
<b>Vietnamese:</b>	Ca vo co

**World Distribution:** Mekong, and Chao Phraya System, Thailand.

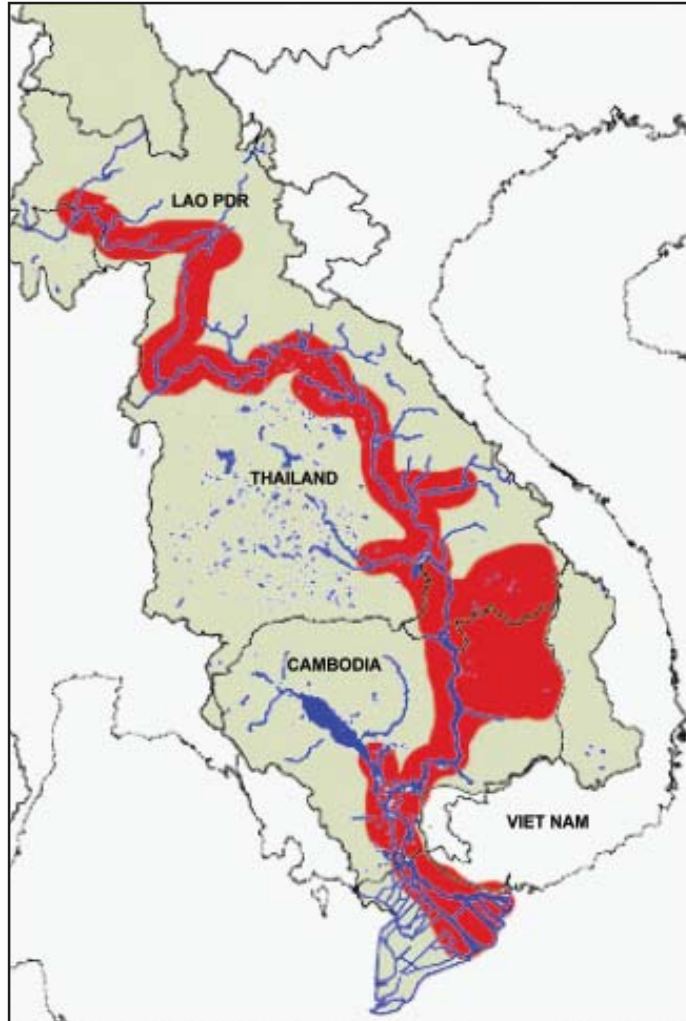
**Mekong Distribution:** occurs throughout the lower Mekong basin, possibly extending into China and Myanmar. Although Rainboth (1996) stated that this species is common in the middle Mekong, it is becoming increasingly rare throughout its distribution range<sup>1</sup> and is listed in the IUCN Red List as data deficient.

**Feeding:** carnivorous– feeds mainly on fish and crustaceans. Has also been reported to scavenge on carcasses, such as dogs and birds. The juveniles feed mainly on insects and insect larvae.

**Size:** up to 250 cm., more commonly 50 cm. *P. sanitwongsei* is second in size only to the Giant Mekong catfish, *Pangasianodon gigas*. At Loei in the upper Mekong, it has been reported to reach a weight of 300 kg.

### Population structure

*Pangasius sanitwongsei* comprises two distinct populations in the Mekong mainstream. The lower population occurs along the stretch from the upper Mekong delta (i.e. just downstream of the Cambodian- Vietnamese border) to the Khone Falls. The upper population is confined to the Mekong mainstream above the Khone Falls, but is mainly distributed along the stretch from Vientiane to the border between the Lao PDR, Thailand and Myanmar.



*Pangasius sanitwongsei* does not migrate over the Khone Falls. However, it is caught at Ban Hang Khone just downstream from the Khone Falls (Baird, 1998; Singanouvong et al. 1996b), where it presumably preys on migrating fish, especially small cyprinids, undertaking their dry-season upstream migrations.

### Critical Habitats

*Spawning habitats:* unknown.

*Feeding habitats:* both juveniles and adults appear to remain in the Mekong mainstream (and probably some of the large tributaries) rather than entering the floodplains. Juveniles are caught regularly in the Mekong

around Vientiane, where they are believed to spend most of their time feeding on small aquatic animals near the bottom. Adults prey on fish in the mainstream and probably rely to a large degree on migratory fish passing through their area.

*Refuge habitats:* adults remain in deep pool habitats during the dry season, possibly only leaving them on short 'hunting trips' when migrating fishes pass through the area.

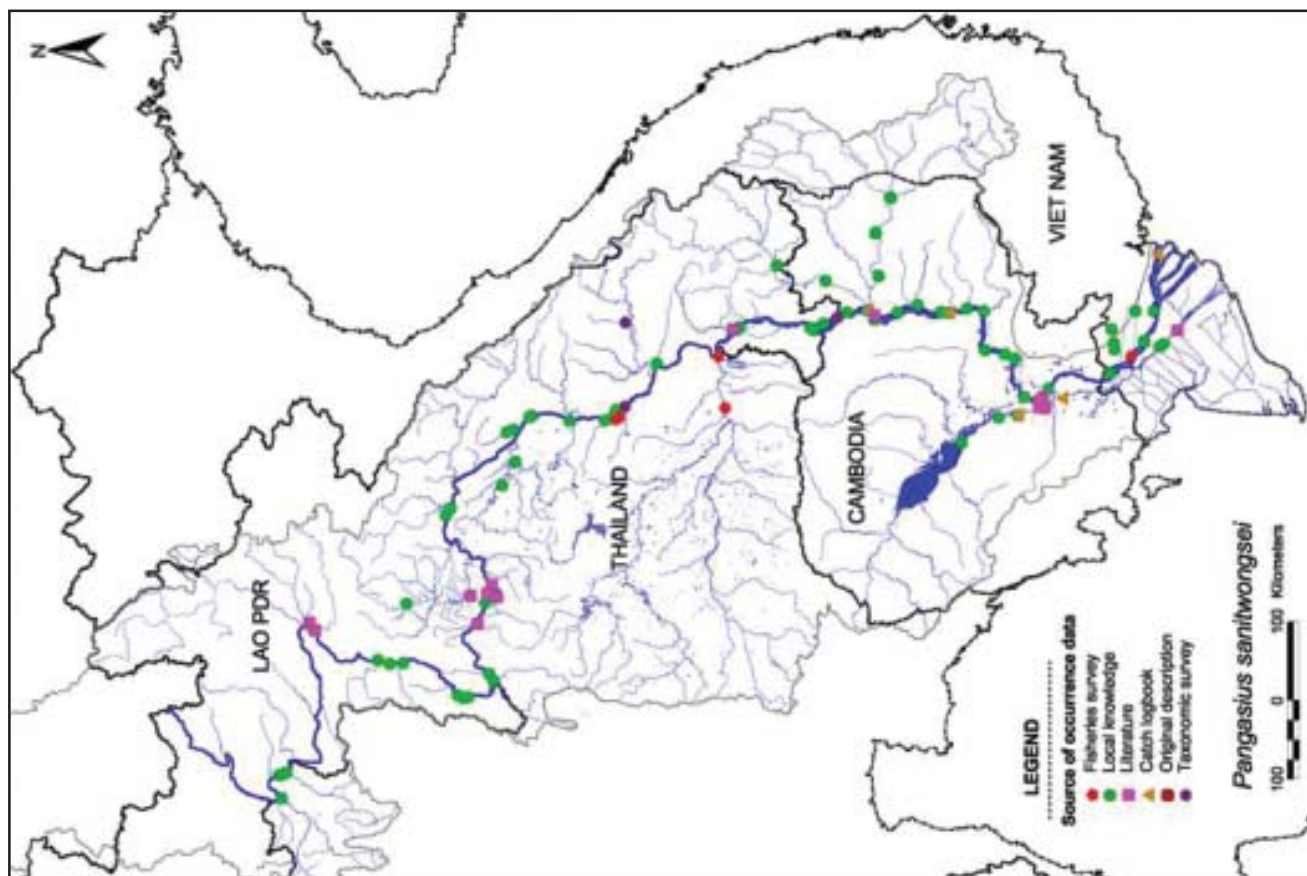
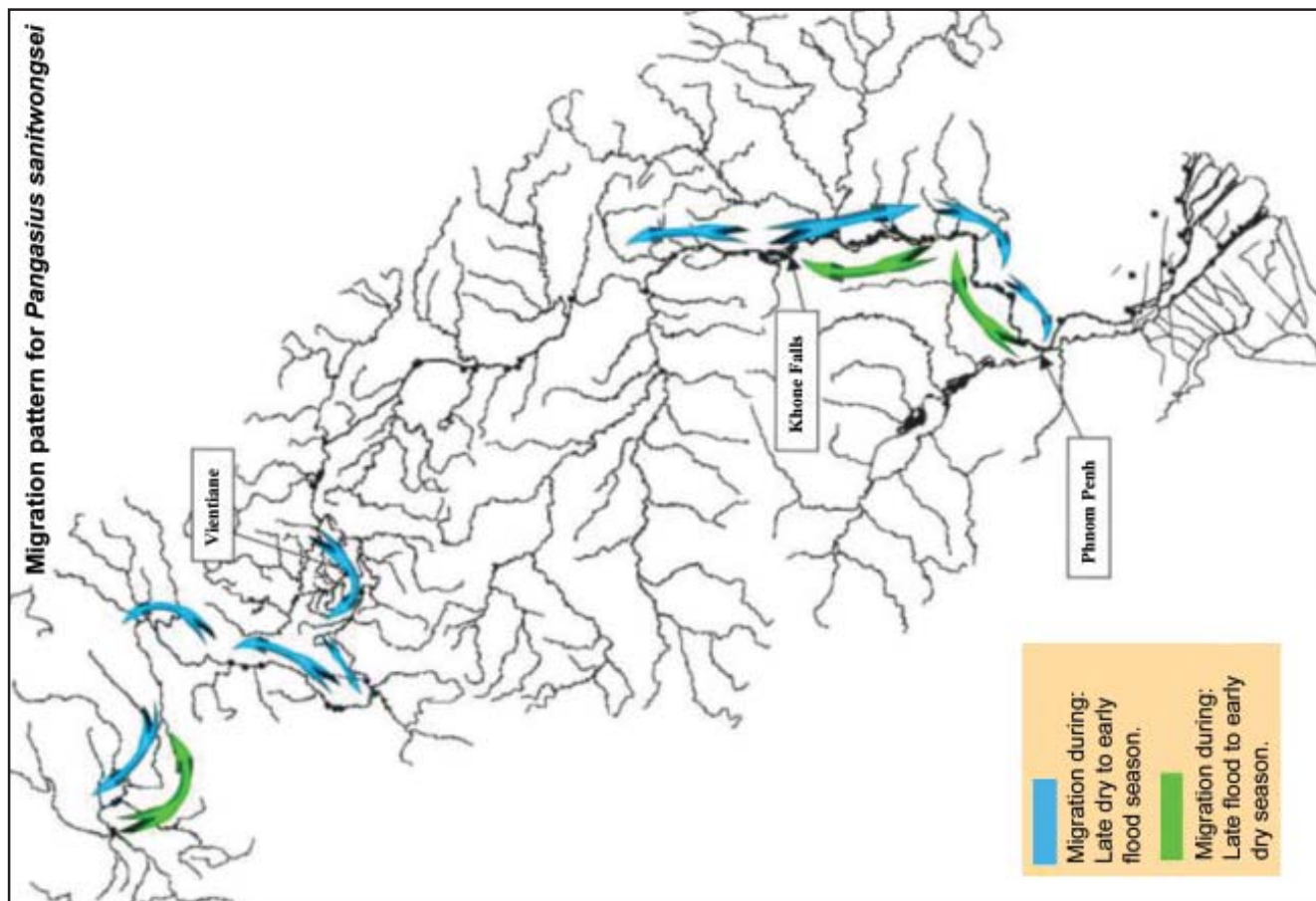
### **Life Cycle**

Both populations of *Pangasius sanitwongsei* spawn in the upper sections of their respective stretches during May to July. Larvae and juveniles drift downstream until they reach their nursing areas. The southern population migrates upstream at the end of the flood season, triggered by receding water levels.

When they reach sexual maturity, the fish undertake spectacular spawning migrations. This has been reported for the northern population, i.e. from dry season refuges in Xayaboury and upstream toward the border between Lao PDR, Thailand and Myanmar. In Bokeo and Chiang Khong, near the border, these migrations are reported to occur just before the spawning migrations of the giant Mekong catfish (*Pangasianodon gigas*), i.e. in April- May.

### **Fisheries**

Due to its increasing rarity now *P. sanitwongsei* plays an insignificant role in the fisheries basin-wide.



## *Paralaubuca typus* Bleeker, 1865



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Pelagic river carp
<b>Khmer:</b>	Trey slak russey
<b>Lao:</b>	Pa taap
<b>Thai:</b>	Pla pab, Pla tab
<b>Vietnamese:</b>	Ca thieu mau

This species appears very similar to *Paralaubuca riveroi*.

**World Distribution:** Mekong, and Chao Praya System, Thailand.

**Distribution:** occurs throughout the lower Mekong basin and probably beyond into China. It is one of the common species of the Mekong<sup>1</sup>.

**Feeding:** carnivorous – feeds mainly on zooplankton (e.g. planktonic crustaceans) and insects, which it catches at the water surface. May consume seasonally inundated riverine vegetation and plant seeds during the rainy season. Is also known to scavenge.

**Size:** up to 18 cm, matures at 12 cm..

### Population structure

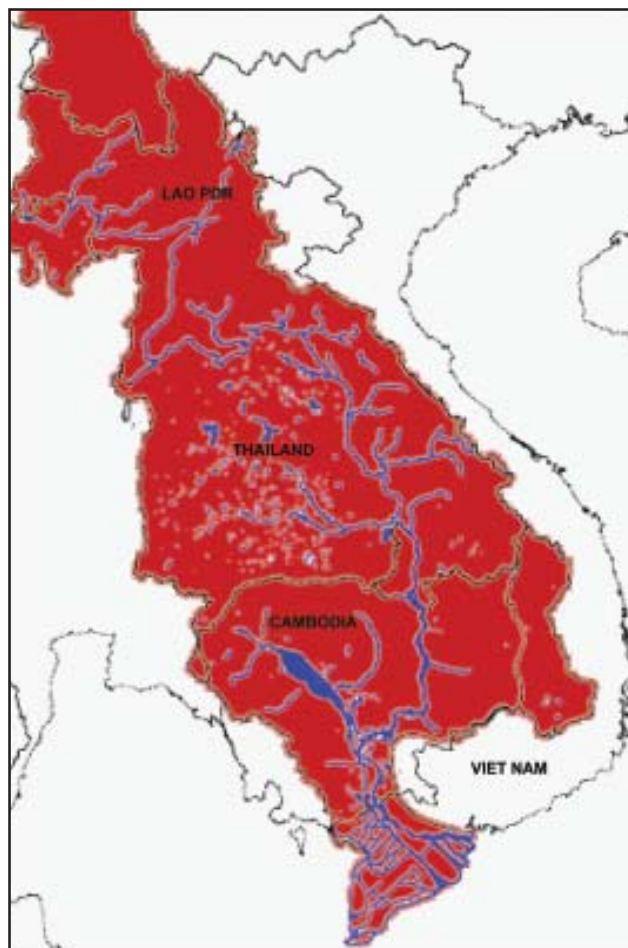
From above the Khone Falls (i.e. approximately from Pakse) and down to the Mekong Delta, *Paralaubuca typus* constitutes one single population, possibly with many spawning sites in the upper sections of this stretch. In the middle Mekong, there are probably several populations, each associated with a major tributary. There appears to be a distinct population located in the upper Mekong (i.e. from Loei River and upstream).

### Critical habitats

**Spawning habitats:** *Paralaubuca typus* spawns in the pelagic zone of the Mekong and larvae are taken to their nursery habitats by the water flow. Spawning behaviour has also been reported near floodplain habitats<sup>1</sup>.

**Feeding habitats:** the larvae and young juveniles feed on floodplain habitat during the flood season. Adults feed in main river channels, e.g. on insects at the surface.

**Refuge habitats:** the species is reported to spend the dry season in deep pool habitats along the Mekong mainstream<sup>1</sup>, and probably also some of the major tributaries (e.g. the Sesan catchment).



<sup>1,2,3,4</sup> See page 20 for information on footnotes

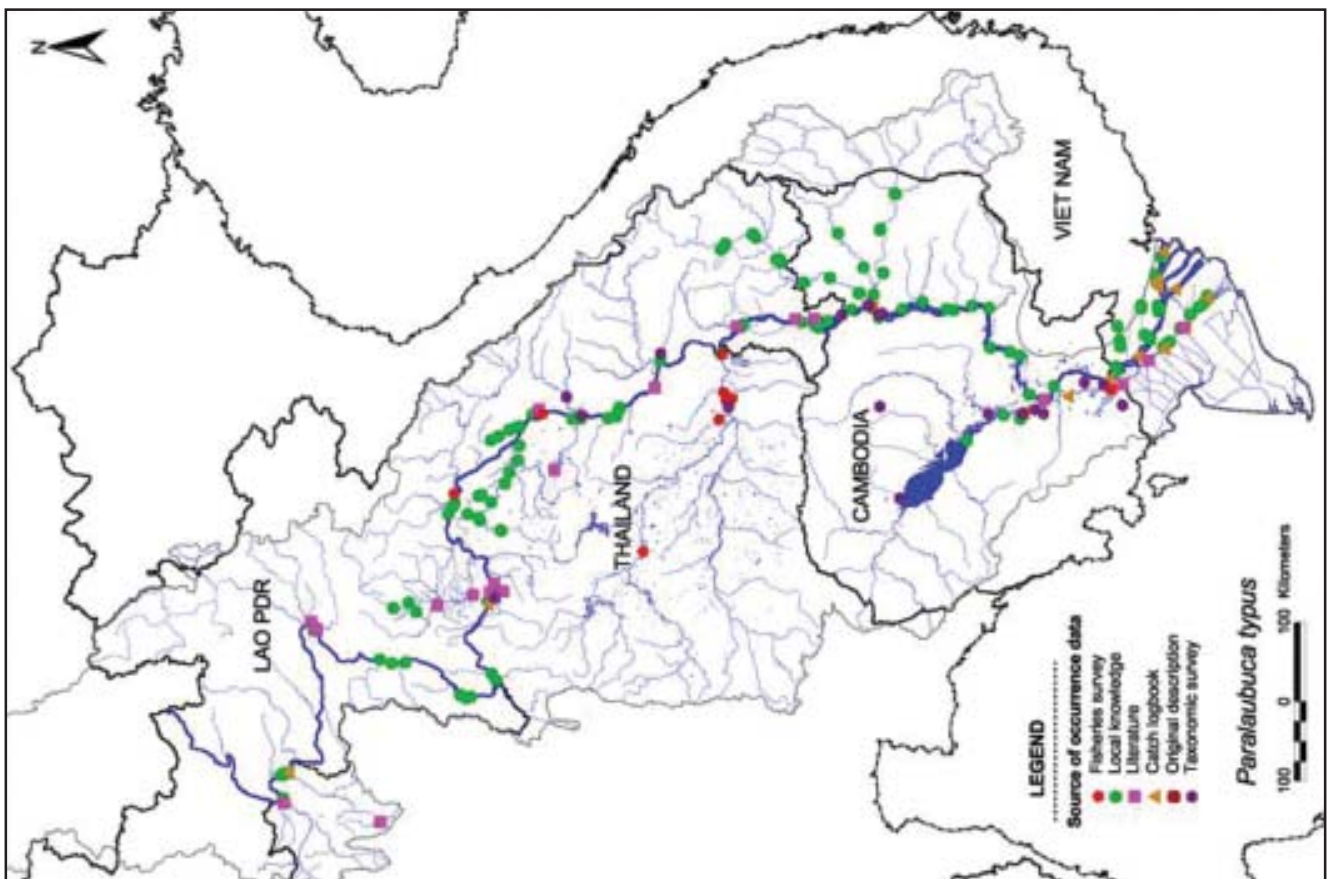
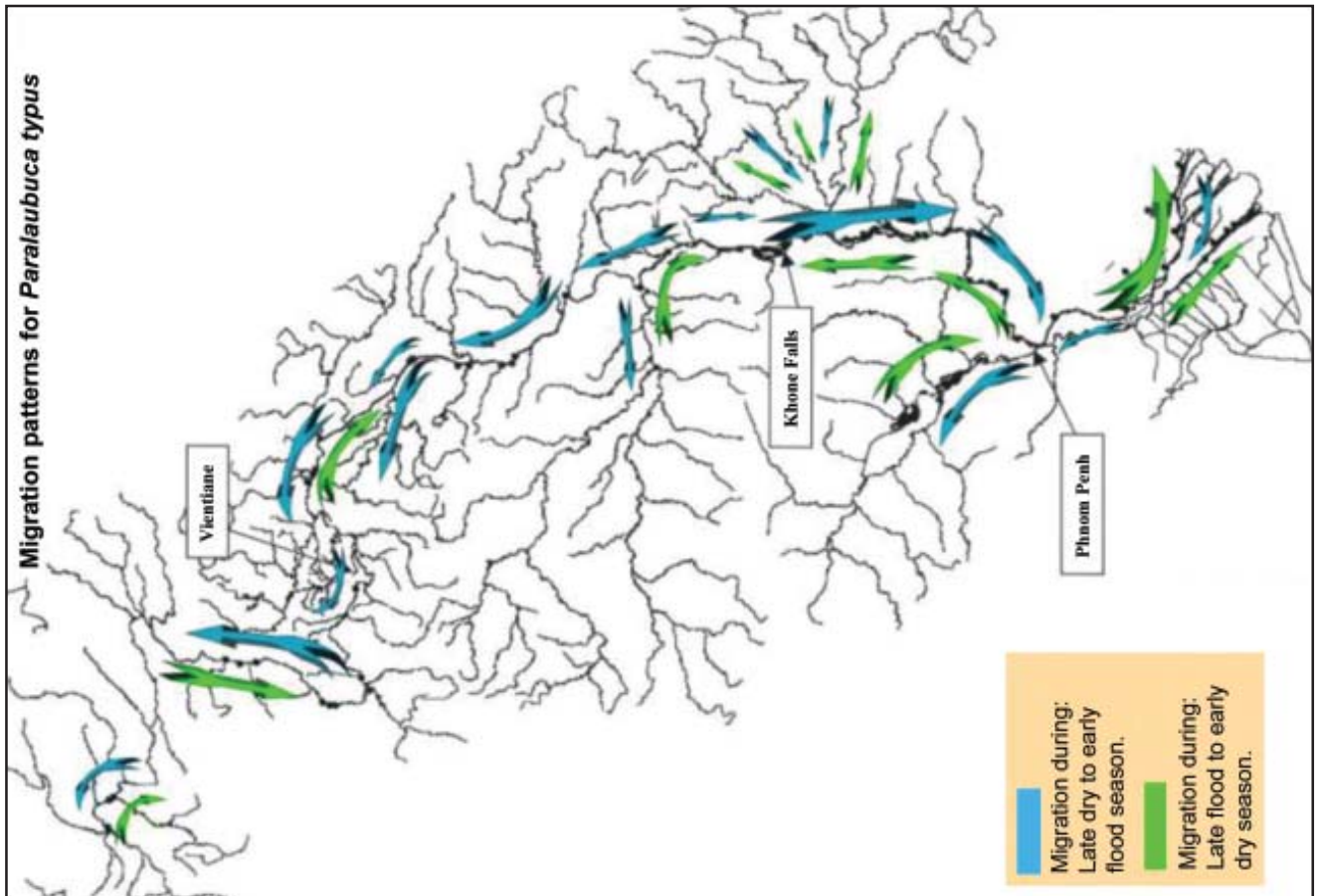
### **Life Cycle**

*Paralabuca typus* is a surface-swimming species that migrates in large schools. It spawns at the onset of the flood season (May to July) in mid-water in the Mekong and possibly in large tributaries. The eggs and larvae are swept downstream and out into flooded areas, e.g. in the Tonle Sap system and Mekong Delta. Juveniles and adults also spend the flood season on the floodplain. When the water begins to recede, the fish (young-of-the-year as well as adults) migrate back into tributaries (e.g., the Tonle Sap River) and eventually back into the Mekong mainstream.

Together with other small migratory fishes, *Paralabuca typus* takes part in a dispersal migration all the way from the Great Lake/Tonle Sap River system to the Mekong and upstream to beyond the Khone Falls between November and February.

### **Fisheries**

*Paralabuca typus* is one of the most important fishes in the specialised *tone* trap fishery at Ban Hang Khone from January to March (Baird, 1998). This fishery mainly targets small migratory cyprinids. It is also one of the important species in the *dai* fishery of the Tonle Sap (Lieng et al. 1995). The species was also recorded in market surveys at Stung Treng during February 1994 and Kratie during January-February<sup>3</sup>.



## *Probarbus jullieni* Sauvage, 1880 and *P. labeamajor* Roberts, 1992



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Jullien's barb, Thicklip barb
<b>Khmer:</b>	Trawsak, Trawsak Sor
<b>Lao:</b>	Pa ern ta deng, Pa ern khao
<b>Thai:</b>	Pla yee sok thong, Earn hang mum
<b>Vietnamese:</b>	Ca tra soc trung, Ca tra soc moi



Along with the third species of the genus (*P. labeaminor*), these species are included in the IUCN List of Endangered Animals, *P. jullieni* as “endangered”, and the other two as “data deficient”. In addition, *P. jullieni* is listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Appendix I. *Probarbus jullieni* is one of the most esteemed species of the Mekong and is a potential “flagship species” for the region (Mattson, et al. 2002).

**World Distribution:** *P. labeamajor* is endemic to the Mekong. *P. jullieni* occurs in the Mekong, the Chao Phraya System, Thailand, and in Pahang and Perak, Malaysia.

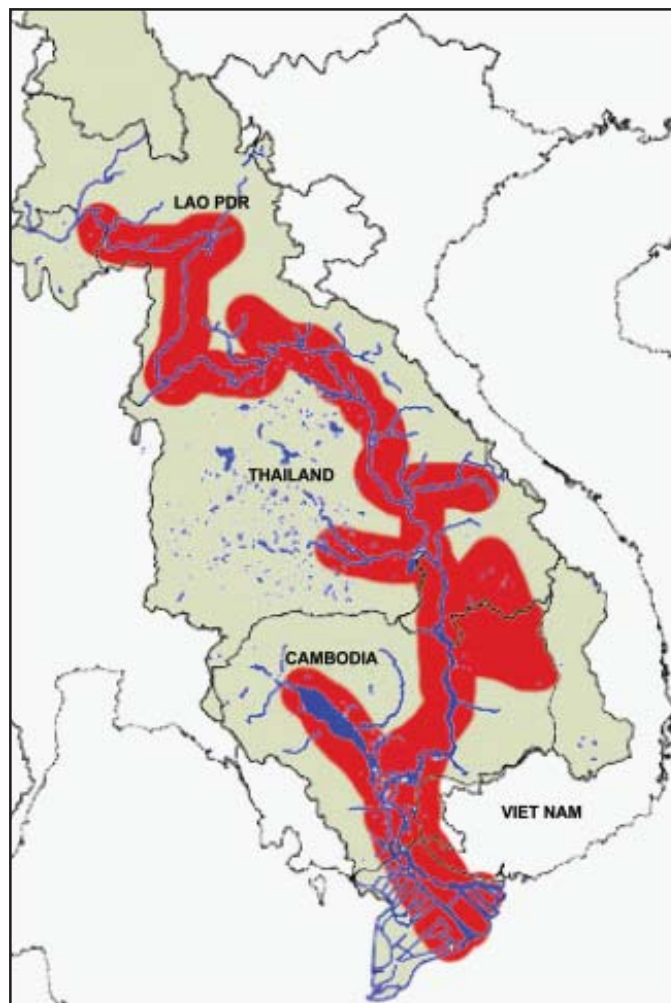
**Mekong Distribution:** Both species occur throughout the lower Mekong basin, possibly extending into Myanmar and China. The two species appear to overlap almost completely in both distribution and ecology, although future studies may shed more light on the differences between them. Generally intolerant of habitat alterations, they have disappeared from areas affected by impoundments.

**Feeding:** feed on aquatic plants and invertebrates including molluscs, crabs, insects, aquatic insect larvae, and zooplankton. Juveniles feed on small gastropod sand snails, fruits, insects and detritus. The species is a night-time feeder.

**Size:** up to 150cm. and 165 cm for *P. labeamajor* and *P. jullieni* respectively.

### Population structure

Several spawning grounds for *Probarbus* have been identified throughout the basin, suggesting that several distinct populations occur, probably for both species. However, the fact that no spawning grounds have been identified downstream from Stung Treng in northern Cambodia suggests that there is only one population between northern Cambodia and the Mekong delta in Viet Nam, including the Tonle Sap / Great Lake system.





### Critical Habitats

*Spawning habitats:* unlike most other Mekong fishes, *Probarbus* spawns in the middle of the dry season, from December to February. During this time, the mature fish migrate upstream to specific spawning areas. First, they congregate for some time at deep areas downstream from the actual spawning site. After some time they begin courtship migrations upstream to a specific “display” area, where intense and very visible courtship behaviour takes place (e.g. splashing at the surface and jumping). Then pairs of fish migrate for a short distance (e.g. 100-200 metres) to a relatively shallow area, where they spawn.

Several specific spawning grounds for *Probarbus* have been identified, including; Ou River, northern Lao PDR (Viravong, 1996); Loei (Thailand) at a site named Bung Ghang<sup>1</sup>; and Nam Lik, upstream from the confluence with Nam Ngum River<sup>1</sup>.

*Feeding habitats:* during the first few months of their lives the larvae and small juveniles remain in river channel habitats. Juveniles of 2-4 cm. stay mainly on shallow sandy beach habitats near riverbanks. The juveniles enter floodplain habitats during the flood season.

*Refuge habitats:* large fishes stay in deep pools of the Mekong during the dry season<sup>1</sup>.

### Life Cycle

Large mature adults migrate upstream to their spawning grounds, where they spawn during December-February. Eggs, larvae and small juveniles drift downstream to their nursery habitats, which are shallow, sandy reaches of the river. When the monsoon season arrives, the juveniles actively migrate to floodplains, where they spend the flood season feeding. When water recedes at the beginning of the dry season, the large juveniles move back into the river channels and migrate to their dry season refuge habitats together with many other species. *Probarbus* species probably take several years to become sexually mature.

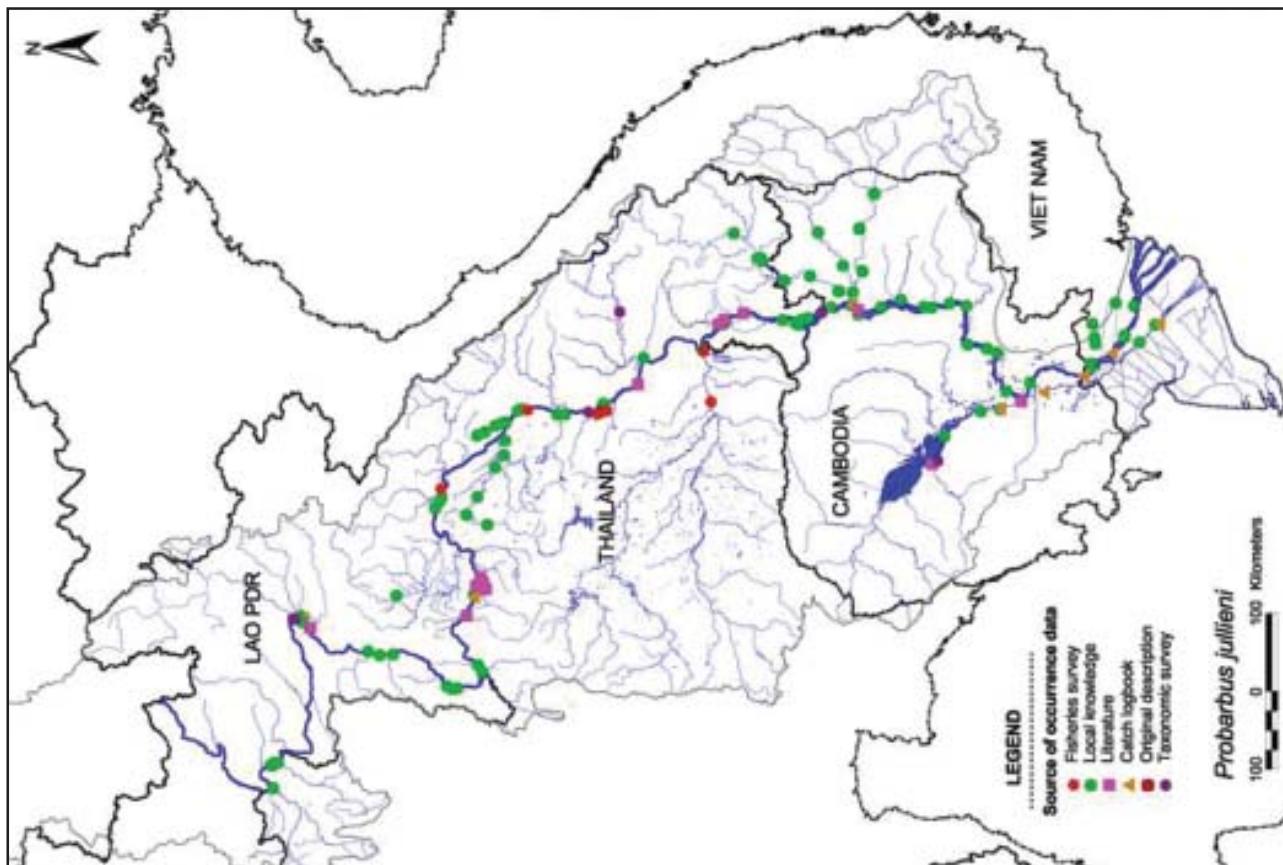
### Fisheries

Baird (1998) documented the *Probarbus* fisheries from October to January at Ban Hang Khone, just below the Khone Falls. Virtually all *Probarbus* spp. caught were in reproductive condition. The main species was *Probarbus jullieni*, accounting for more than 65% of the catch during that period, with *Probarbus labeamajor* accounting for just over 12%.

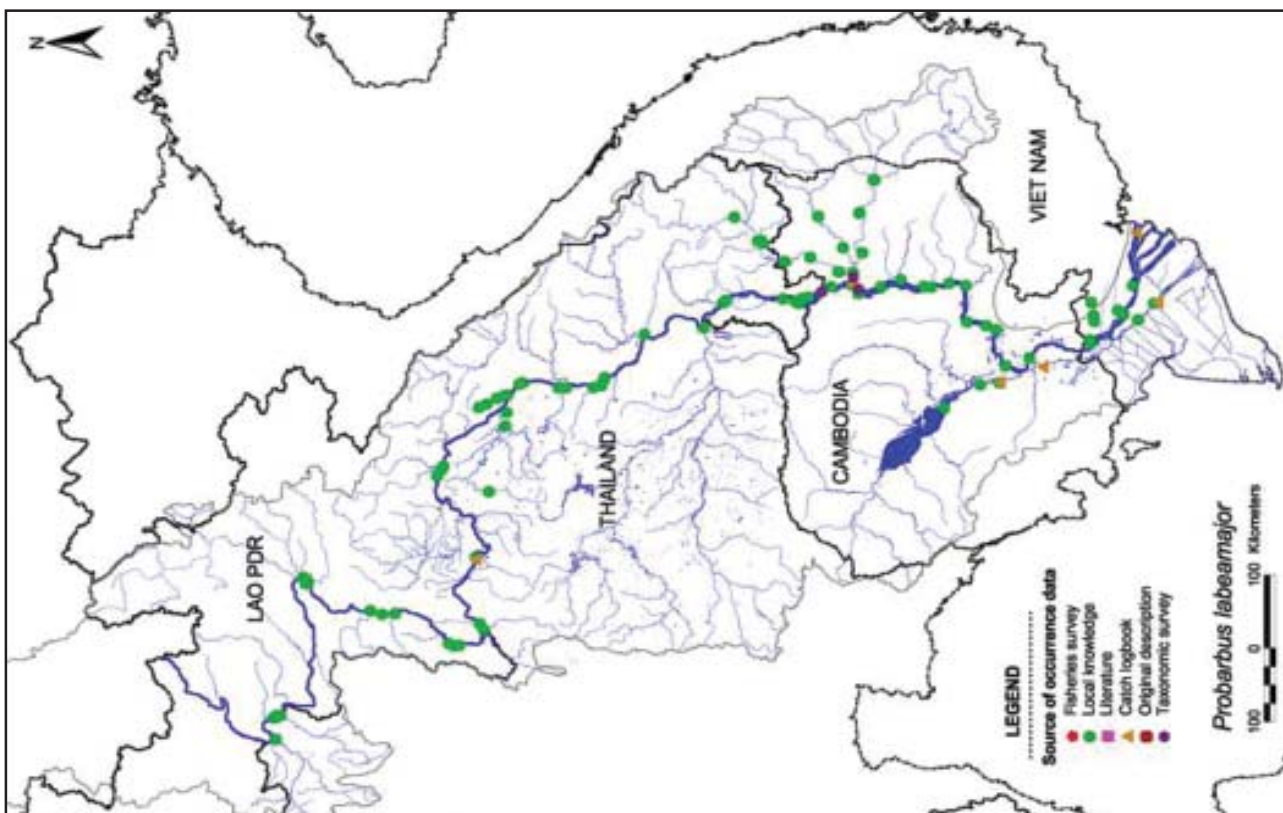
Along the middle Mekong, *P. jullieni* and *P. labeamajor* are caught sporadically, particularly during their spawning migrations in December – February<sup>1,3</sup>.

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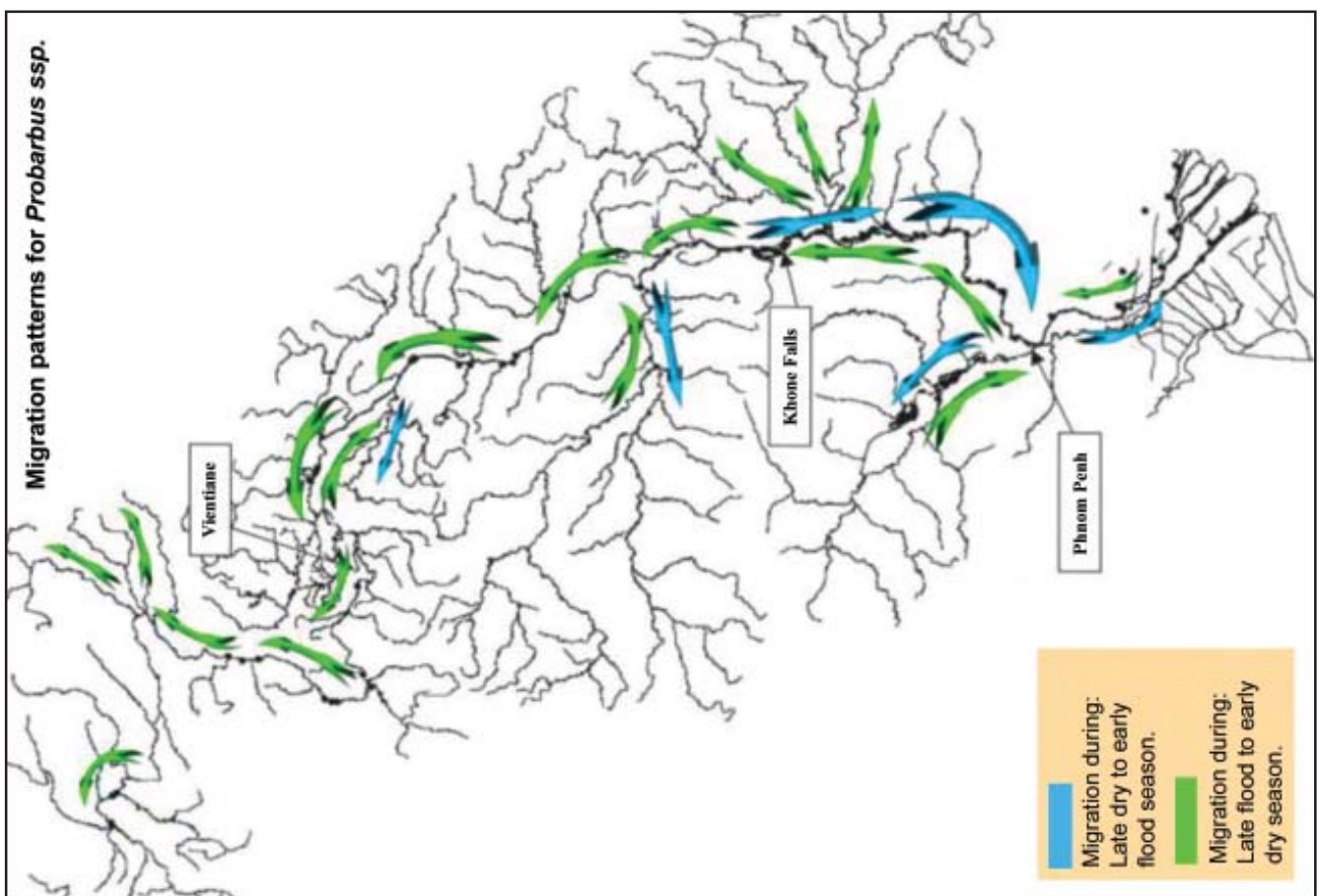
<sup>1,2,3,4</sup> See page 20 for information on footnotes



*Probarbus jullieni*



*Probarbus labeamajor*



## *Puntioplites falcifer* Smith, 1929



<b>Family:</b>	Cyprinidae (Minnows and Carps)
<b>English:</b>	Silver barb
<b>Khmer:</b>	Trey chra kaing
<b>Lao:</b>	Pa sa kang
<b>Thai:</b>	Pla sa gang
<b>Vietnamese:</b>	Ca dan xam

**World Distribution:** endemic to the Mekong.

**Mekong Distribution:** a common species, occurring basin-wide in the mainstream of the Mekong and inhabiting deep holes in the riverbed. According to Rainboth (1996) *Puntioplites falcifer* has a preference for large rivers and avoids standing water. A similar species, *Puntioplites proctozysron*, prefers lentic environments.

**Feeding:** omnivorous – feeds mainly on algae, periphyton, detritus, bark, leaves, worms, insects and insect larvae. In reservoirs, it feeds extensively on filamentous algae growing on the remains of drowned trees.

**Size:** up to 35 cm.

### Population structure

Each major tributary of the Mekong may have its own population. Self-sustaining populations are found in reservoirs.

### Critical habitats

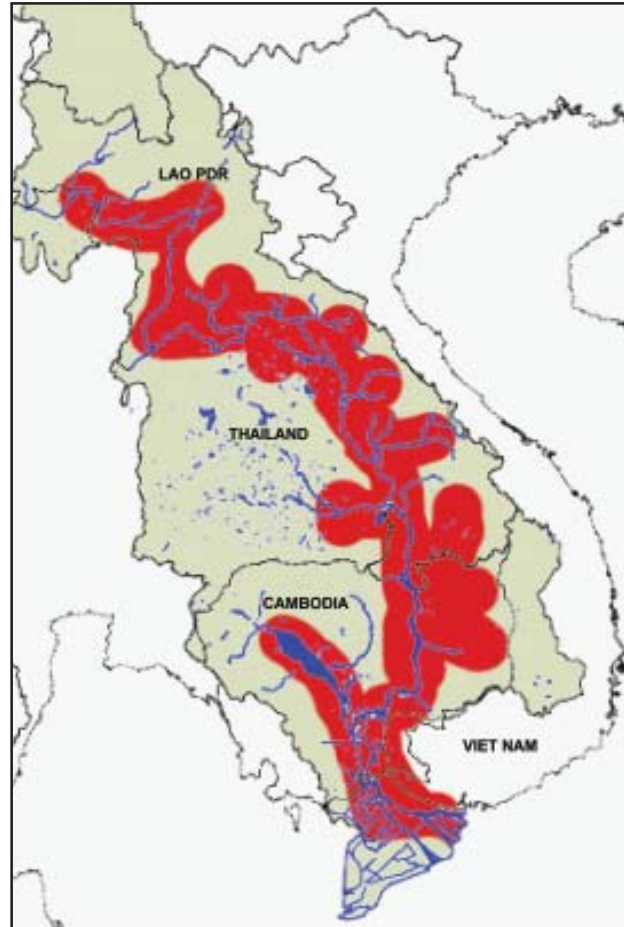
**Spawning habitats:** spawns in the Mekong mainstream and major tributaries.

**Feeding habitats:** the larvae and juveniles spend the first few months feeding on floodplain habitats, either associated with tributaries (particularly in the middle Mekong), or in the Tonle Sap - Mekong delta floodplains.

**Refuge habitats:** spends the dry season in deep pools in the Mekong mainstream<sup>1</sup> and its larger tributaries.

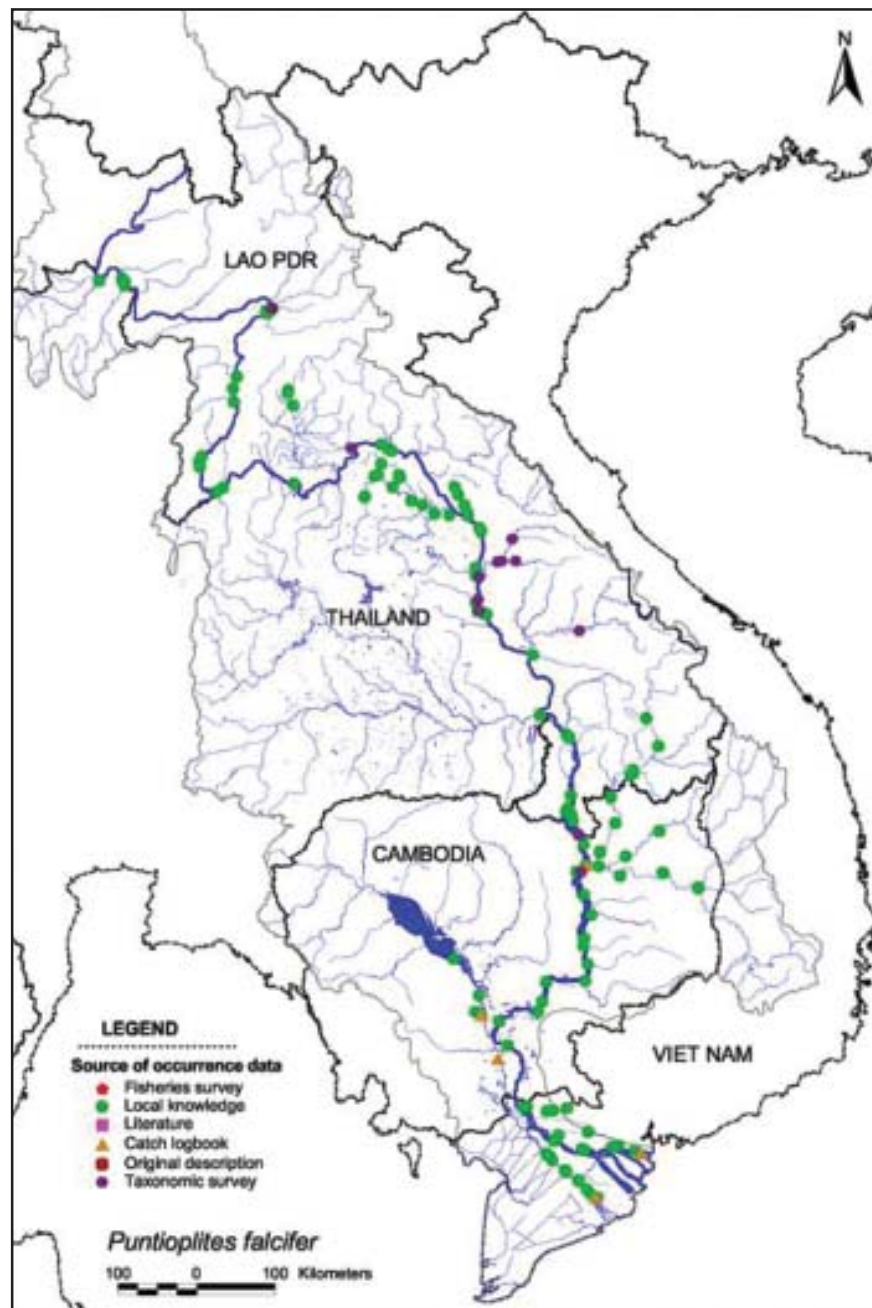
### Life cycle

During the first heavy rains of the monsoon season, *Puntioplites falcifer* migrates from its dry season refuge habitat in the Mekong mainstream into the nearest large tributary to spawn. The juveniles spread out along the riverbank and into floodplains, and some of them also enter the Mekong mainstream. When the river level falls, adults and juveniles move back to the Mekong River, where they stay in deep pools until the next flood season. *Puntioplites falcifer* is a social species and during its seasonal migrations, it migrates in large schools. It also often migrates together with a number of other species, such as *Cosmochilus harmandi*, *Cirrhinus* spp., *Morulius chrysophekadion* and *Bangana* sp. Water level appears to be a very important factor for triggering migration, since migration activities often intensify during rapid rises or falls in water levels.



## Fisheries

*Puntioplites falcifer* is important in fisheries throughout its range. It is also important in reservoirs, e.g. the Nam Ngum Reservoir in Lao PDR.



## *Tenualosa thibaudeaui* (Durand, 1940)



<b>Family:</b>	Clupeidae (Herrings)
<b>English:</b>	Laotian shad
<b>Khmer:</b>	Trey kbork
<b>Lao:</b>	Pa mak paang
<b>Thai:</b>	Pla mark phang
<b>Vietnamese:</b>	Ca chay be

**World Distribution:** endemic to the Mekong.

**Mekong Distribution:** occurs throughout the lower Mekong basin, possibly extending into Myanmar and China, although it appears to be rare throughout its range<sup>1</sup>. Previously one of the most important species in the Khone Falls fisheries, it has undergone a drastic decline in recent years (Roberts 1993b) and is listed as endangered in the IUCN Red List.

**Feeding:** filter-feeding in mid-water - feeds on microscopic food such as phytoplankton or bacteria found on particulate matter.

**Size:** up to 30 cm.

### Population Structure

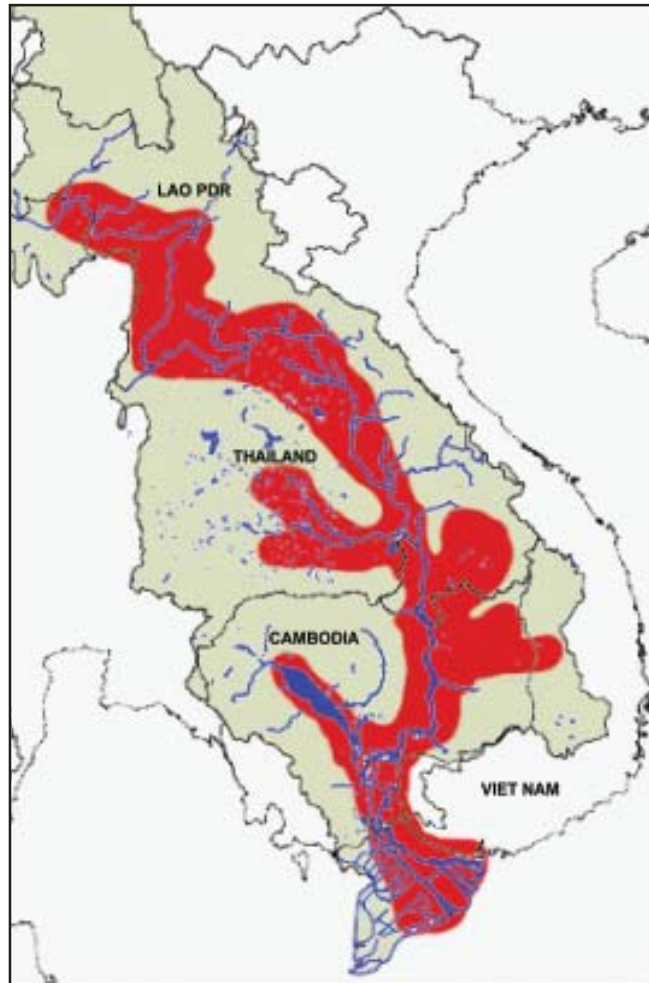
At least two populations of *Tenualosa thibaudeaui* exist in the Mekong River. One is focused around Xayaboury and upstream, and the other in the lower Mekong River from the Mekong Delta to Paksan in the Lao PDR. The latter may represent more than one population, e.g., one above and one below the Khone Falls.

### Critical Habitats

**Spawning habitats:** it spawns at the onset of the flood season (mainly during May-June). The eggs and larvae are carried into flooded areas by the rising waters. Little is known about specific requirements for spawning habitats. However, as with other clupeids, it is believed to spawn in mid-water within main river channels. The main requirement may thus be that spawning takes place at a site with an appropriate distance upstream from the nursery/feeding habitat, ensuring that the larvae reach those habitats through passive drift.

**Feeding habitats:** juveniles and sub-adults of *Tenualosa thibaudeaui* feed in floodplain habitats. The main feeding habitat for the lower population is the extensive floodplains in the Tonle Sap / Great lake system, Southern Cambodia and the Mekong delta in Viet Nam. The feeding habitats of the upper population are mainly associated with floodplains of major tributaries, such as the Songkhram River<sup>1</sup>.

**Refuge habitats:** during the dry season, *Tenualosa thibaudeaui* lives in deep pool habitats in the Mekong River<sup>1</sup>. The lower population in particular spends the dry season in deep pools along the stretch from Kratie to Stung Treng in Northern Cambodia.



## **Life Cycle**

After spawning, eggs and early stages of larvae drift downstream with the water current and eventually enter their rearing and feeding habitats on the floodplains. The larvae get onto the floodplains through passive movements, following the movements of the water as it spills over the riverbanks. For the upper population, the early larval stages may depend mainly on fringing floodplains and flooded islands in braided sections of the river (e.g. around Khone Falls and further upstream, above the mouth of the Mun River).

At the onset of the dry season in October, the falling water levels trigger fish to move out of floodplain areas and into main river channels<sup>1</sup>. Eventually, they end up in the Mekong River, where they start upstream migrations towards dry season refuge habitats<sup>1</sup>. The movements are also under lunar influence, since they mainly occur just before, and during, the full moon period. The movements continue until February<sup>1</sup>.

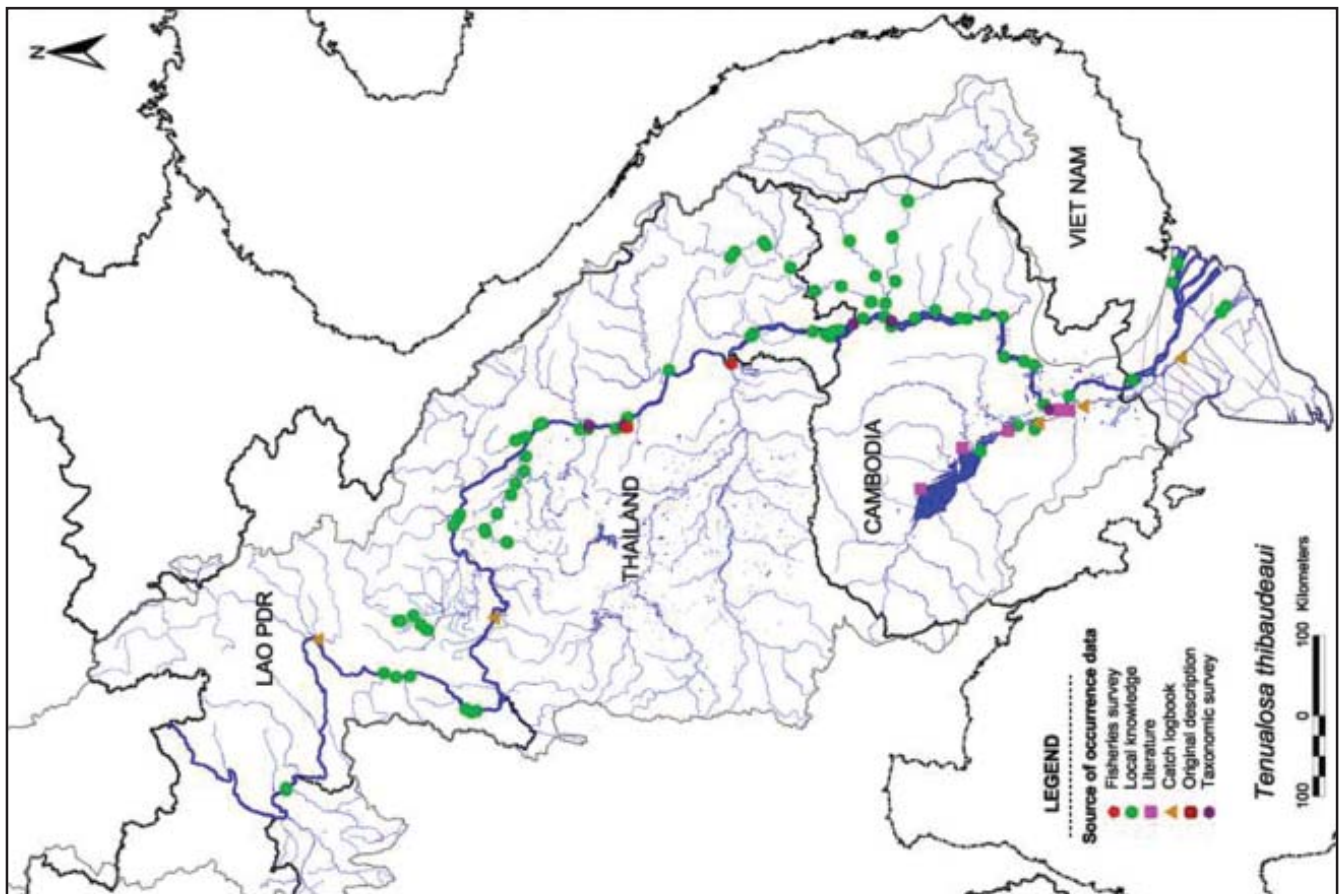
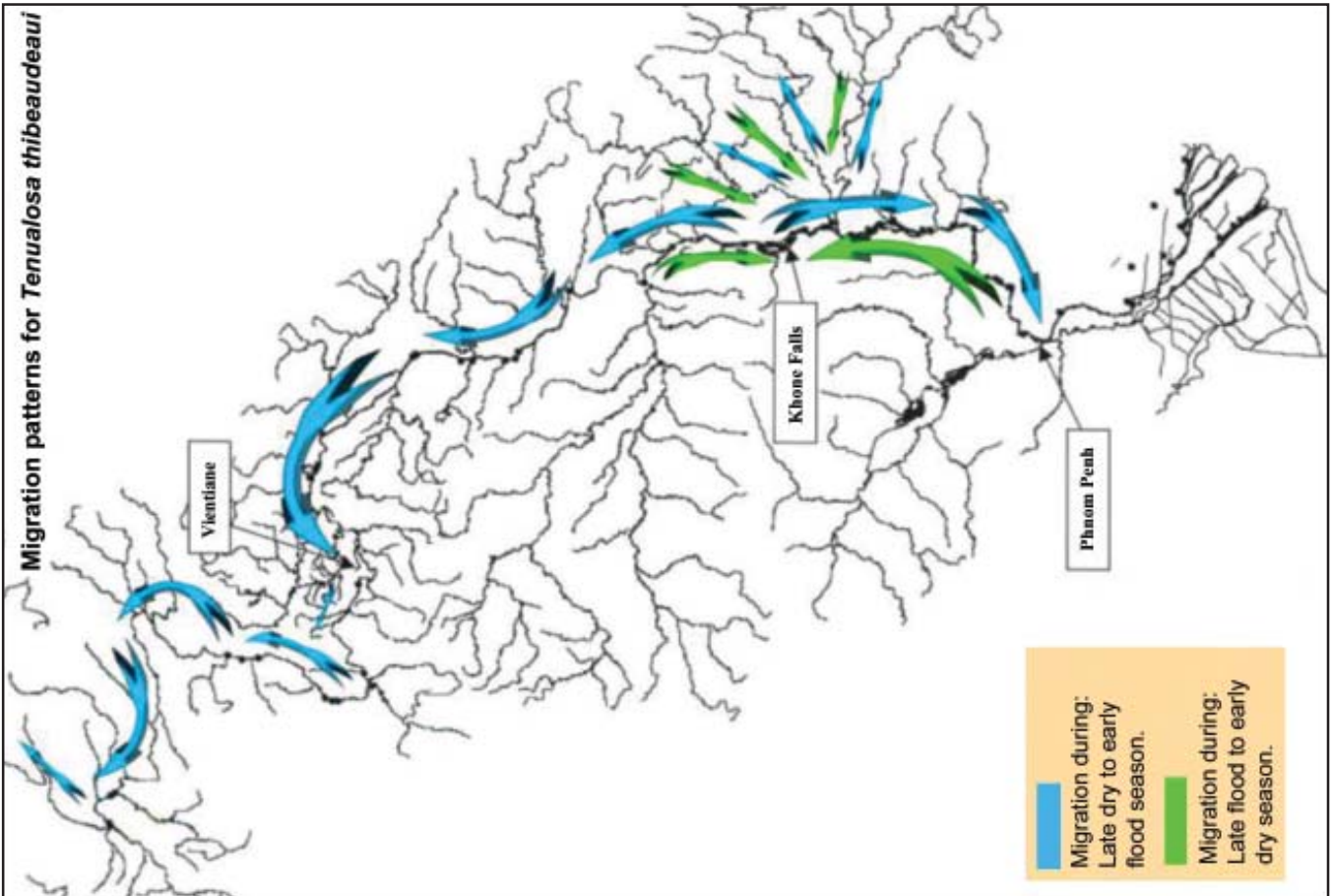
The next monsoon season (May-June) triggers mature members of the species to undertake upstream spawning migrations. Individuals that are not yet mature, migrate back downstream towards floodplain habitats (lower population), or upstream and into tributary floodplains (upper population, middle population).

## **Fisheries**

The species has experienced a drastic decline in recent decades, probably as a result of over-fishing as it is particularly vulnerable to gill nets. It was previously one of the most common fishes of the Mekong and a highly esteemed food fish. Today, its role in fisheries is limited although it is still seen regularly in markets, particularly in Cambodia.

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<sup>1,2,3,4</sup> See page 20 for information on footnotes





## *Wallago attu* (Bloch and Schneider, 1801)



<b>Family:</b>	Siluridae (Sheatfishes)
<b>English:</b>	Giant sheatfish
<b>Khmer:</b>	Trey sanday
<b>Lao:</b>	Pa khaow
<b>Thai:</b>	Pla kao, Pla kao khao
<b>Vietnamese:</b>	Ca leo tuh

**World Distribution:** widespread, from Central Asia (Pakistan and Afghanistan) through to Indochina, the Malay Peninsula and western Indonesia.

**Distribution:** occurs basin-wide. It is particularly common in large rivers and on the Lower Mekong floodplain (Rainboth 1996). Found in deep, slow-flowing large rivers and in lakes with a mud or silt substrate. It readily adapts to impoundments.

**Feeding:** a large, voracious predator.

**Size:** up to 200 cm., more commonly 80 cm.

### Population structure

Since it is not considered a long-distance migratory species, *Wallago attu* constitutes multiple populations, each with a relatively small distribution range.

### Critical habitats

**Spawning habitats:** it is believed to spawn in floodplain habitats, laying sticky eggs that attach to bottom substrate<sup>1</sup>.

**Feeding habitats:** the young fish feed mainly on floodplains and swamps. Older and larger fish feed mainly on fishes in river channels. Relies on migratory fishes passing through at certain times of the year.

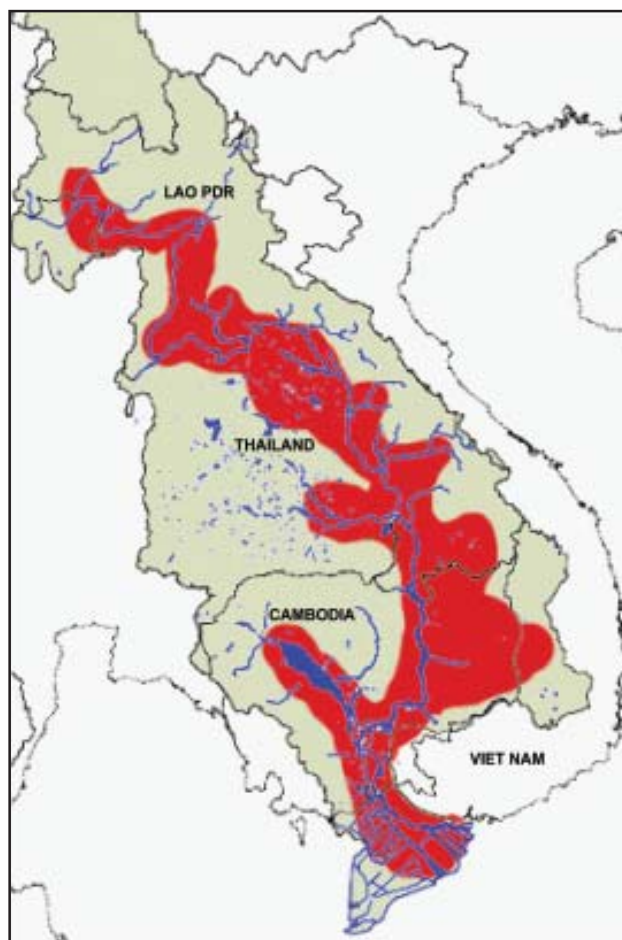
**Refuge habitats:** young fish may spend the dry season in permanent lakes and swamps on the floodplain, whereas larger fish migrate to deep pool refuges during the dry season.

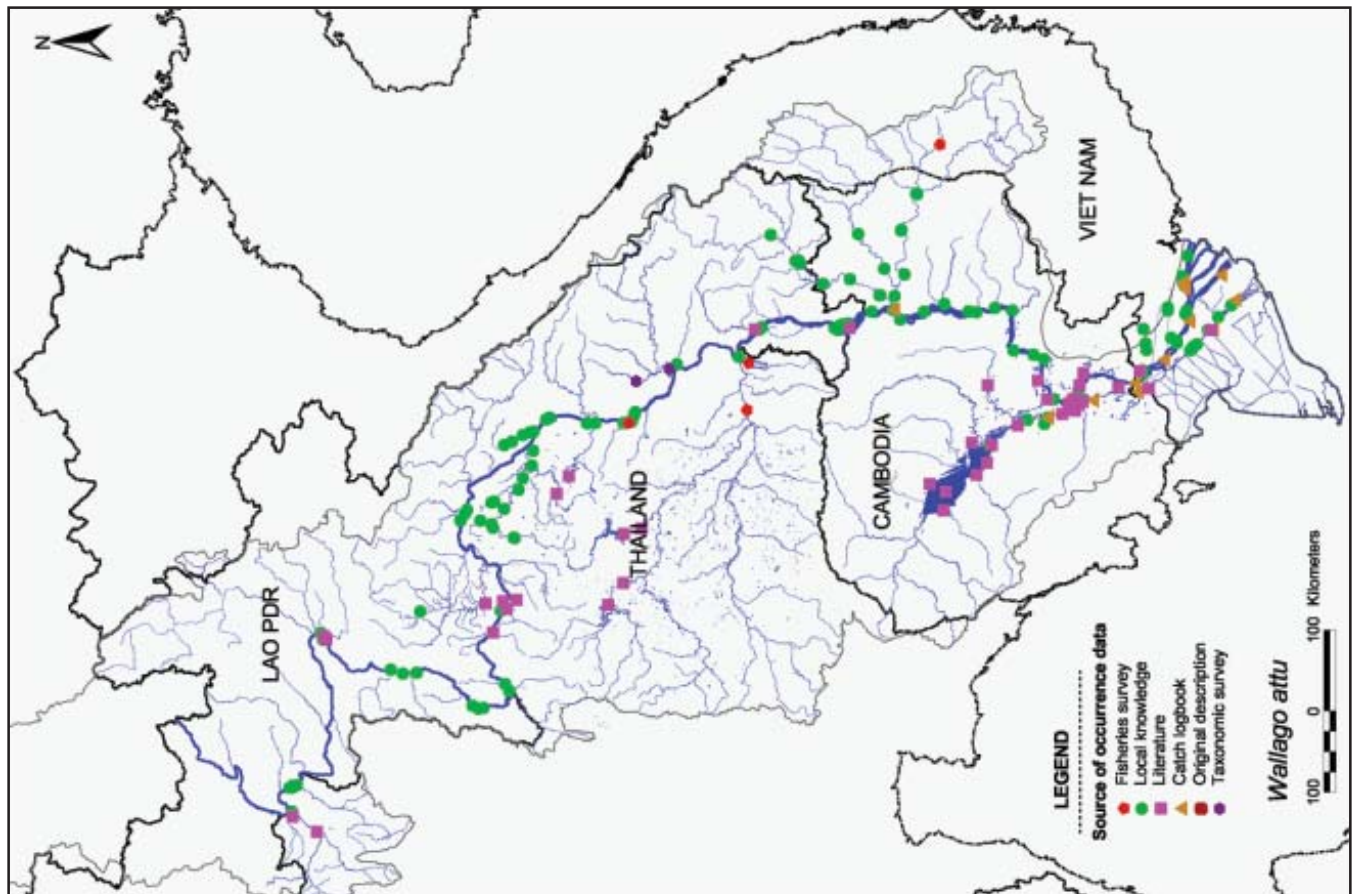
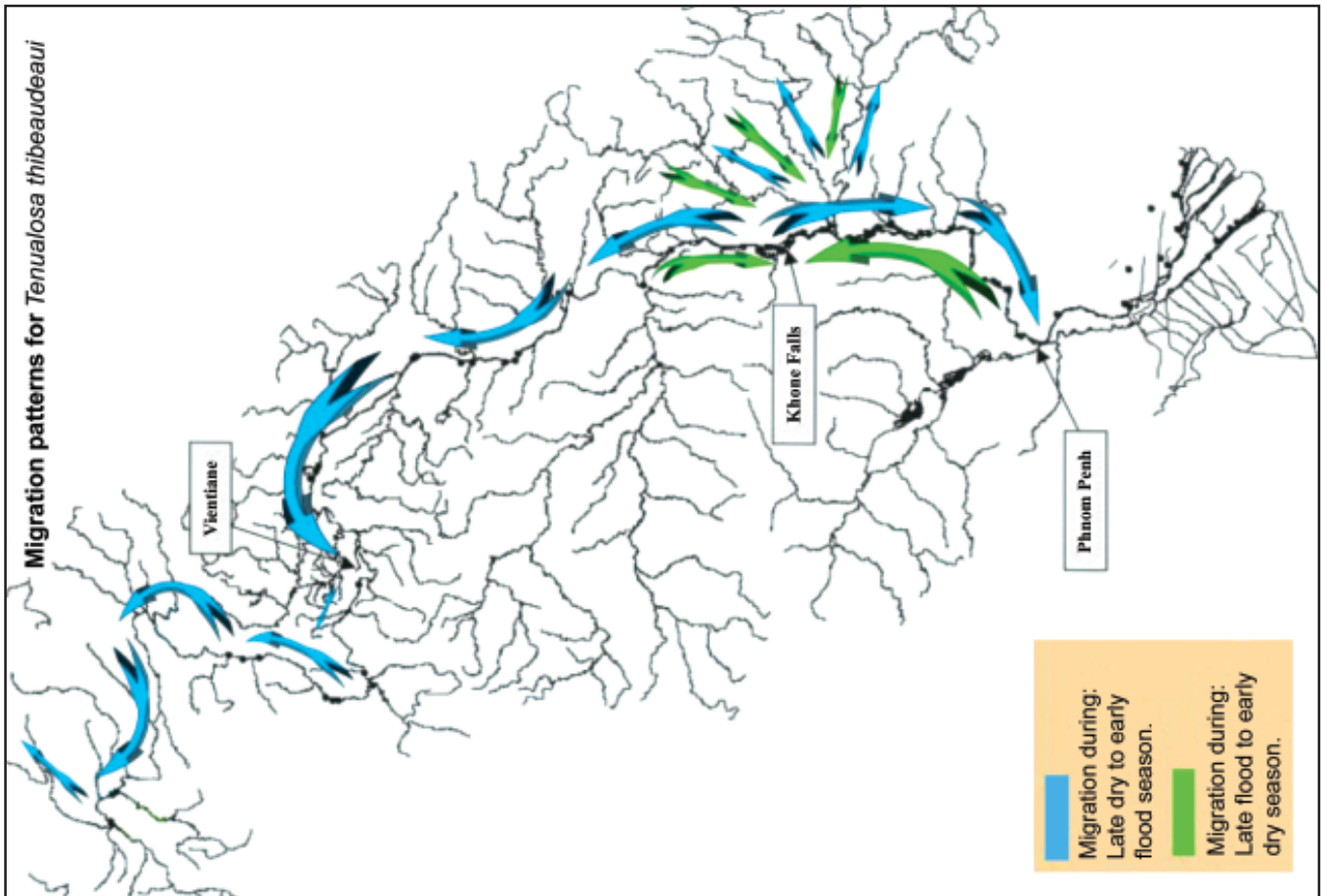
### Life Cycle

The species is a nocturnal predator which only undertakes short longitudinal migrations to the nearest stream, as well as some localised movements to pursue schools of smaller fish on which it preys. During the flood season it stays in swamps, canals and streams on the flood plain, where it also spawns. When the water level in the Mekong mainstream drops and the floodwater recedes, *Wallago attu* migrates to the Mekong River or larger tributaries, where it lives in deep pools until the next inundation period.

### Fisheries

The species is important in fisheries throughout its range and is a high-value fish, particularly in Viet Nam and Cambodia, where it is mainly caught with hook and line, but also with gillnets. Due to its high market value it is often exported, e.g. from Cambodia to Thailand. It is a very good gamefish species.





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