The effects of human activity on the distribution of aquatic Coleoptera in Southeastern England

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The Effects of Human Activity on the Distribution of Aquatic Coleoptera in Southeastern England.

by **R. Carr.**

Abstract: The dispersal of aquatic Coleoptera in Southeast England is shown to be directly related to historic and modern commercial activities of man.

Key words: Water beetles – Southeastern England – distribution – human activity.

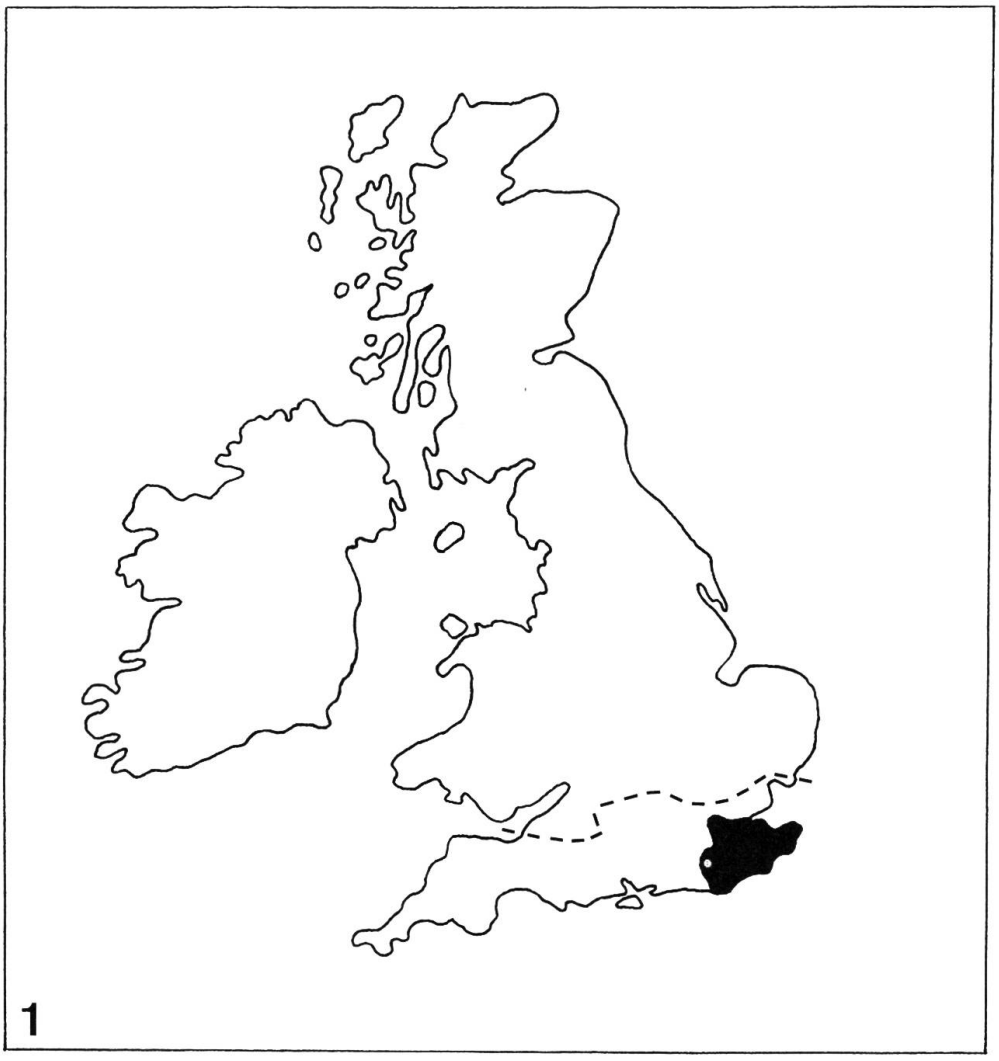
Introduction

Southeast England is largely comprised of the counties of Kent and East Sussex, the aquatic Coleoptera of which have been extensively surveyed in recent years. Foster (1972) provides a detailed review of the East Sussex fauna, and the Nature Conservancy Council has surveyed the area of marshes on the North Kent coast (Palmer, 1981), Romney Marsh (Palmer, 1982), and the Pevensey Levels (Carr, 1983a). I have concentrated most of my investigations on Central Kent, the results of which remain unpublished except for Carr, 1983b).

Despite recent geological concepts that suggest an advance of ice into the English Channel during the earlier Glaciations (Kellaway et al., 1975), it is generally accepted that the maximum extension of the ice (Fig. 1) did not extend as far south as the River Thames (Jones, 1981). Consequently, the formations of large lakes and glacial kettle holes occurring in previously glaciated areas of the British Isles are absent from Southeastern England.

Extensive investigations in the Southeast have revealed that considerable periglacial activity has occurred throughout the area. This is confirmed by the presence of Coombe deposits and ancient landslides (Jones, 1981), though flooded periglacial hollows such as the pingo-like formations on the edge of the Weichselian advance in Norfolk do not occur in Southeast England.

Foster, 1982) has shown certain relict British species of aquatic Coleoptera to be associated with periglacial hollows, notably *Hydroporus glabriusculus* Aubé, and *H. scalesianus* Stephens, neither of which occurs in Southeast England. Very few relict species are found in



--- Maximum southern extent of ice in Britain
■ Area of the survey

the Southeastern counties, those that are being mainly confined to running water. For exemple, *Hydroporus longicornis* Sharp occurs in a few remaining spring-fed valley bogs in East Sussex (Foster, 1972). *Agabus labiatus* (Brahm) is exceptional in that it exists abundantly in a few temporary pools on Chislehurst Common (National Grid Reference TQ 4470) where it was first taken by Philp (1969).

Most fen species are generally confined to the coastal marshes where they have survived by existing in the steep-sided drainage ditches excavated by man. The distribution of all stagnant water species of Coleoptera has been affected by man's commercial activity, mainly on the geological substrates of the area. This has been undoubtedly disad-

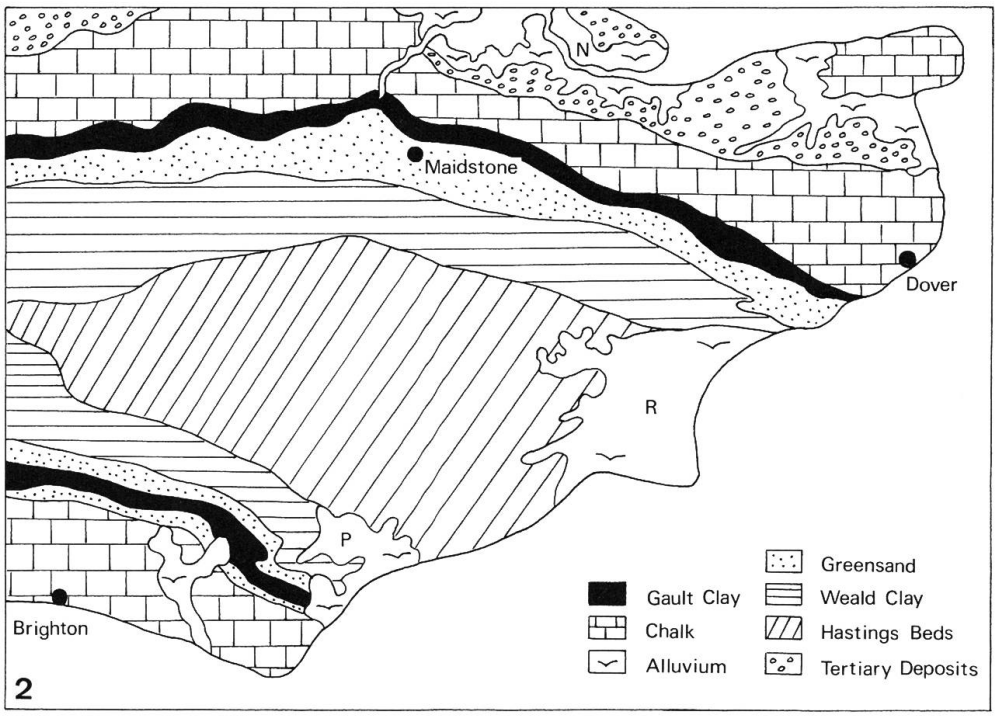
vantageous to some species, but directly advantageous to others. The majority of stagnant water species found in the area are capable of flight, an important distributional factor where new habitats are regularly being formed.

Presentation

The following commentary is an attempt to define the effects of human activities on certain habitats, including the production of new ones. Comments are made on particular species whose distribution appears to have been significantly affected by these activities.

The Coastal Marshes

Alluvial flats occur in several areas around the coasts of Kent and East Sussex (Fig. 2). The most extensive are Romney Marsh, which comprises parts of both counties, the Pevensey Levels of East Sussex and the North Kent Marshes around the estuaries of the Medway and Swale. Smaller alluvial flats occur near Lewes, East Sussex, and in the Wantsum Strait, Kent. There is no remaining natural fenland, all the marshes having been artificially drained by the excavation of channels.

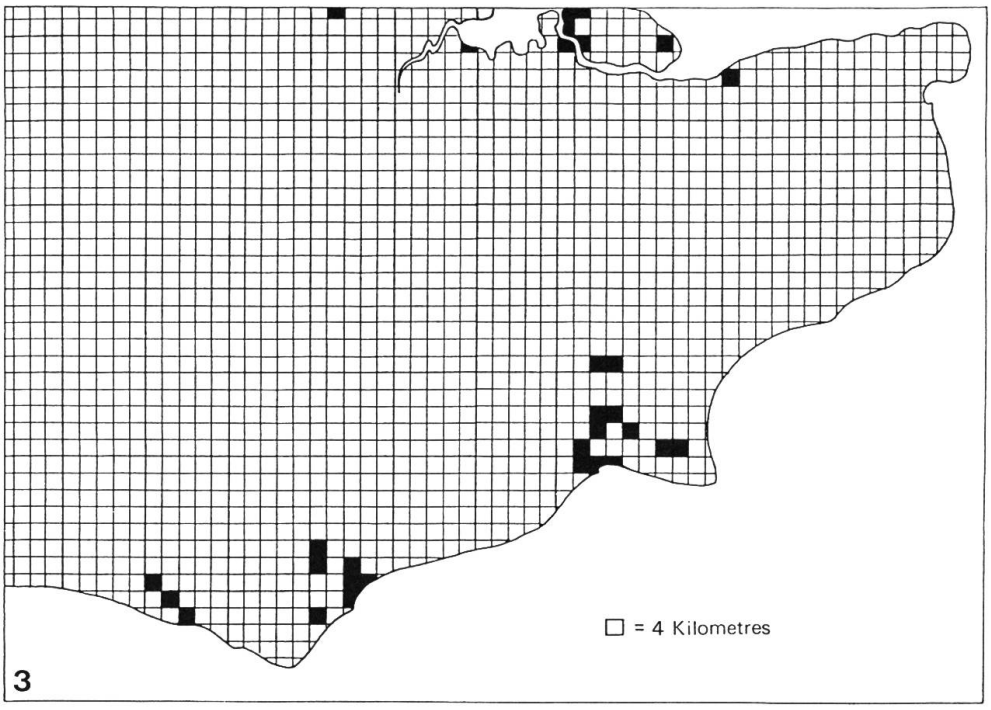


GEOLOGICAL SKETCH MAP OF SOUTHEAST ENGLAND (GENERALISED)
N=NORTH KENT MARSHES R=ROMNEY MARSH P=PEVENSEY LEVELS

The largest alluvial area, at Romney Marsh, has been drained intermittently since prehistoric times, total drainage being completed by the seventeenth century (Gallois, 1965). Originally the reclaimed land was used as grazing for cattle and sheep. Arable farming is now becoming more favourable economically, and the transition from ancient pasture to arable land is rapidly developing with the ensuing leaching of nitrates into adjacent ditches.

The coastal marshes have been regularly visited by Coleopterists over the years, and there are extensive historic records of aquatic Coleoptera (Woodcock, 1944; Balfour-Browne, 1941, 1940-58). Detailed surveys have also been carried out in recent years by the Nature Conservancy Council. The marshes generally retain a rich fauna of typically detritus pond species, as well as halophil and halobiont (as defined by Hebauer, 1974) species in the more brackish areas. Local fen species such as *Hydrochus elongatus* (Schaller), *H. ignicollis* Motsch, *Gyrinus suffriani* Scriba, and *Dytiscus circumcinctus* Ahrens occasionally occur, but appear to be confined to old grazing land.

Similarly, more abundant species such as *Coelostoma orbiculare* (F.), *Hydrophilus piceus* (L.) and *Limnoxenus niger* (Zschach) are restricted to drains on old pasture (Palmer, 1982: Carr, 1983a), and may well



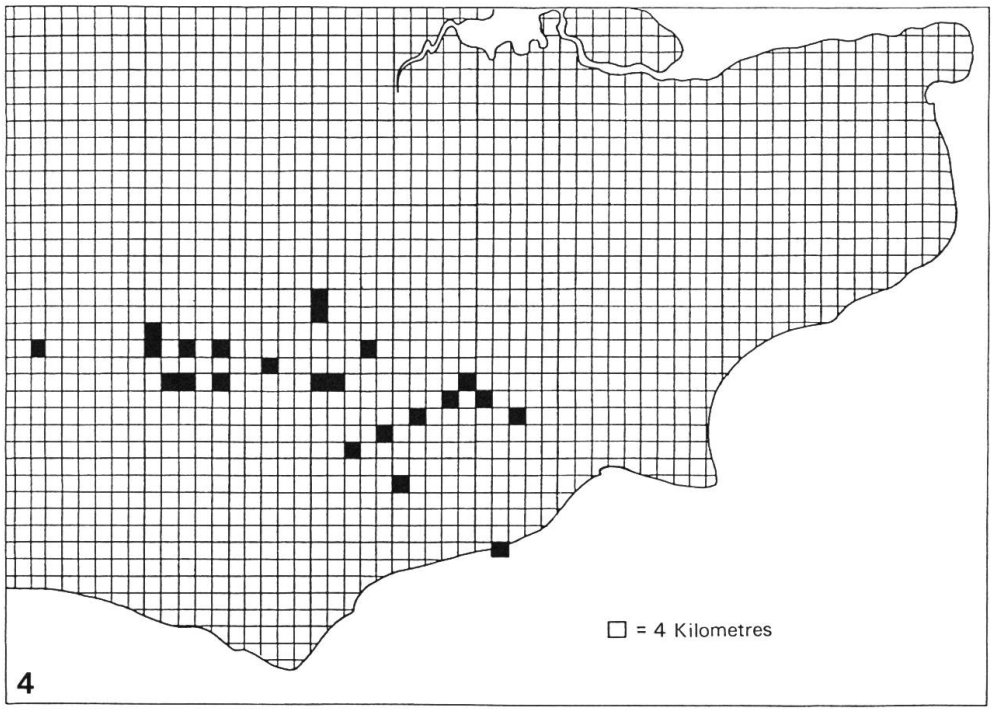
LIMNOXENUS NIGER

be endangered by the encroachment of arable farming. The distribution of *L. niger* in East Sussex and most of Kent is shown on figure 3.

At Pevensey, many of the ditches are choked with vegetation. This has proved beneficial for certain species, notably *Enochrus coarctatus* (Gredler), *Cymbiodyta marginella* (F.) and *Hydaticus seminiger* (Degeer), the latter species appearing to have invaded the area quite recently. Unless the development of arable farming slows down, many local fen species could eventually disappear completely from the marshes.

Reafforestation

A variety of species of aquatic Coleoptera inhabit shady ruts and puddles along the rides in forestry plantations. Typical species include *Agabus melanocornis* Zimmerman and *A. chalconotus* (Panzer) which are occasionally found together (Carr, 1982), *Hydroporus discretus* Fairmaire, and occasionally *Laccobius atrocephalus* Reitter, as well as many common temporary water species such as *Ilybius fuliginosus* (F.), *Agabus bipustulatus* (L.), *A. nebulosus* (Forster), and *Helophorus* species. *Agabus melanarius* Aubé has also occurred in similar situations in East Sussex (Foster, 1972), but despite searching suitable habitats, I have failed to find the species in Kent.



HYDROPORUS LONGULUS

Hydroporus longulus Mulsant is a species which appears to have benefitted from reafforestation, especially in Kent. It occurs in spring water and seepages on the Hastings Beds, a series of acidic Wealden sands and clays which constitutes the central core of Southeastern England, otherwise known as the High Weald (Fig. 4). This formation dominates East Sussex, and extends by outliers into East Kent. Owing to the rugged and undulating topography of this central ridge, arable farming is not practical, so the land remains usually as pasture or woodland, occasionally being cultivated for hop gardens.

The limited distribution of *H. longulus* in Kent reflects with some precision the outermost easterly exposures of the Hastings Beds (Carr, 1983b). It occurs in artificial land drains in the large conifer plantations at Bedgebury and Hemsted Forest.

In addition to restricting the development of arable farming, reafforestation has also provided *H. longulus* with man-made habitats in which it now exists, together with *H. ferrugineus* Stephens, and occasionally the chestnut-coloured form of *H. memnonius* var. *castaneus* Aubé, all of which occur more commonly in spring water on the extensive Central Ridge of East Sussex (Foster, 1972).

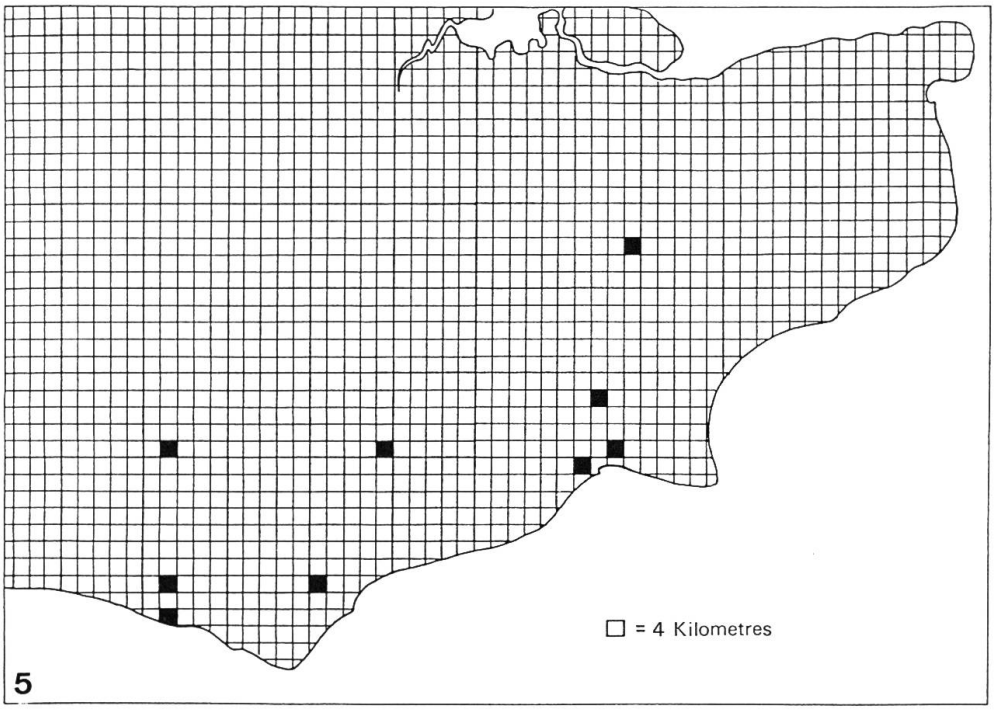
Clay Pits

The abundance of various clays throughout the Wealden area of Southeast England has resulted in the excavation of clay pits of various sizes. Bricks are still manufactured from many of the clay formations, particularly Weald Clay. Clays from the Hastings Beds, Weald Clay and Gault, were extensively worked for "marl", which was then applied to the land for agricultural purposes.

Ironstone was mined from the Wadhurst Clay from as early as Pre-Roman times, the industry reaching its peak during the sixteenth and seventeenth centuries. Excavations for ironstone took the form of "Bell Pits" (Straker, 1931), which sooner or later became filled with water. "Hammer Ponds" and "Furnace Ponds" were also constructed by damming valleys in order to utilise water as a source of power for driving the furnace bellows and the hammers that beat the metal. Ironstone is no longer mined in Southeast England.

Typical species of aquatic Coleoptera which now inhabit the large Hammer Ponds include *Haliplus flavicollis* Sturm, *H. fluviatilis* Aubé, *Laccophilus hyalinus* (Degeer), *Hyphydrus ovatus* (L.), *Graptodytes pictus* (F.) and occasionally *Haliplus confinis* Stephens. The smaller clay pits can now all be classified as detritus ponds, containing vegetation at

varying stages of development. Many common species of Coleoptera occur throughout the Weald within these pits, particularly *Haliplus ruficollis* (Degeer), *Noterus clavicornis* (Degeer), *Ilybius ater* (Degeer), *Hydroporus angustatus* Sturm, *H. erythrocephalus* (L.), *Ochthebius minimus* (F.), and *Hydraena testacea* Curtis. Species with coastal breeding pools sometimes appear in clay pits, notably *Coelambus impressopunctatus* (Schaller), and occasionally *Noterus crassicornis* (Müller), *Dytiscus dimidiatus* Bergsträsser (CARR, 1983b), and *Hydrovatus clypealis* Motsch (Fig. 5). I found the latter species in an acidic clay pit in Longrope Wood, East Kent (N. G. R. TQ 9835), where I had previously taken *Limnebius crinifer* Rey, a species new to the British list (CARR, 1984). This particular clay pit had probably been originally constructed as a decoy pond, and now supports a dense *Sphagnum* carpet containing local species such as *Ilybius guttiger*(Gyllenhal), *Hydroporus neglectus* Schaum, *H. tristis* (Payk.), and *Hydrochus angustatus* Germar. With the exception of *H. tristis,* all these species occur more commonly on the Hastings Beds in West Kent and East Sussex, together with *Hydaticus seminiger.*

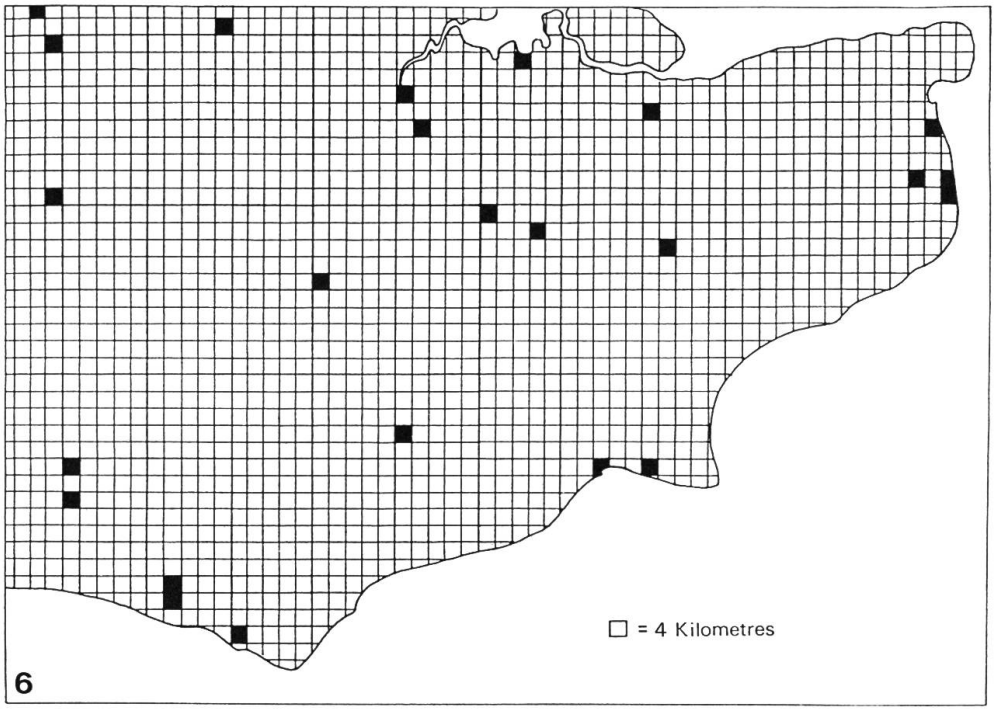


HYDROVATUS CLYPEALIS

Shady ponds may contain *Haliplus heydeni* Wehncke, and densely vegetated pools often support populations of *Nartus grapei* (Gyllenhal),

Ilybius quadriguttatus Lacordaire, *Cymbiodyta marginella* (F), and *Enochrus coarctatus* (Gredler).

A recent agricultural development has been the excavation of reservoirs for the purpose of irrigating fruit crops. When these are constructed directly onto clay, an artificial lining is not necessary, the water being retained by the impermeable nature of the clay. A visit to a one year old reservoir at Sutton Valence, Kent (N.G.R. TQ 8048) in April 1984, revealed *Coelambus confluens* (F.) to be abundant (Fig. 6). I also took eight specimens of *Helophorus longitarsis* Wollaston, a rare species confined to marly pools in Southern England (Angus, 1978).



COELAMBUS CONFLUENS

Although most of the older clay workings contain a rich fauna of aquatic Coleoptera, many of the ponds are in danger of being filled in, especially in the intensively farmed area of East Kent.

Quarrying

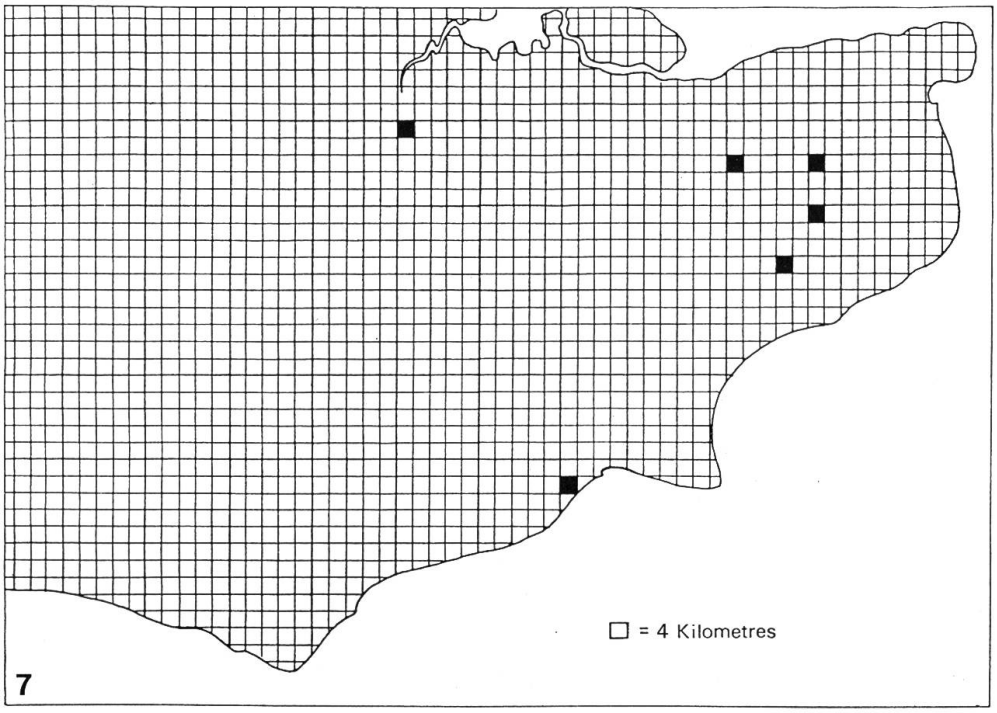
In addition of clay, many other building materials have been excavated in Southeastern England. Building stone was formerly obtained from Weald Clay and from sandstone in the Upper Greensand. Small quantities of building stone are also obtained from Ashdown Sand, the Tunbridge Wells Sand, and the Lower Greensand. Chalk from the

Downs and Gault Clay are used in the manufacture of cement. Ballast is excavated from terraced River Gravels in the Medway and Stour Valleys, and from shingle deposits on the coast. Building sand is quarried from the Folkestone Beds and also from Tertiary deposits near Canterbury.

Newly excavated silt ponds are colonized by certain beetles apparently unable to compete with other species that appear with the establishement of vegetation around the margins of the lakes. Several species are capable of tolerating brackish water conditions near the coast, yet colonize fresh water inland. Among them are *Coelambus confluens, Laccobius biguttatus* Gerhardt, *Rhantus suturalis* (Macleay) [= *pulverosus* (Stephens)], *Enochrus melanocephalus* (Oliver), and *Helochares lividus* (Forster). Another recent addition to the British fauna occurring in a three year old gravel pit in East Kent is *Coelambus nigrolineatus* (Steven) [= *lautus* (Schaum). This species was originally considered a halophil by Zaitsev (1953). It has recently expanded its distribution throughout Europe in newly excavated silt ponds, and is obviously capable of tolerating both brackish and freshwater conditions, the British locality being well inland and not saline.

Other typical silt pond species include *Haliplus flavicollis, H. laminatus* (Schaller), *Potamonectes depressus elegans* (Panzer), *Hygrotus versicolor* (Schaller), *Hydroglyphus* (= *Guignotus) pusillus (F.), Coelambus impressopunctatus, Laccobius minutus* (L.), and *L. striatulus* (F.). *Haliplus confinis, H. fulvus* (F.), and *H. obliquus* (F.) are also occasionally found in such habitats.

Older gravel pits with well established vegetation provide favourable habitats for other species which would occur naturally elsewhere. *Hydroporus marginatus* (Dufts.) is primarily a running water species (Balfour-Browne, 1940), which was first recorded from Kent in a Chalk stream by Angus in 1963 (Fig. 7). The stream has furnished collectors with specimens since, but the species has also been taken in a gravel pit at New Hythe by E. Philp (= pers. comm.). I took it in a similar situation at Chartham (N.G.R. TR 1055) with *Limnebius nitidus* (Marsham), a usual inhabitant of the coastal marshes. *Ilybius fenestratus* (F.) and *Ochthebius nanus* Stephens also occur in the New Hythe quarries. The former species is allegedly flightless (Jackson, 1956) but occurs in large ponds throughout the Weald as well as slow moving drains, and is apparently extending its range towards the marshes (Foster, 1972). *O. nanus* is primarily coastal, though Balfour-Browne (1958) reported its occurence in brick pits in Somerset. The continued excavation of



HYDROPORUS MARGINATUS

gravel has undoubtedly assisted the distribution of certain water beetles. As the silt ponds gradually change into detritus ponds, they are invaded by the commoner stagnant water species, and the more particular silt pond species disappear, as was the case of *Haliplus furcatus* Seidl. in Somerset (BALFOUR-BROWNE, 1962). The very large lakes with deep bottoms provide richly oxygenated water for such species as *Laccophilus hyalinus.* as well as open water for surface frequenters like *Gyrinus marinus* Gyllenhal, and *G. substriatus* Stephens. Other members of this genus, notably *G. caspius* Ménétriés and *G. paykulli* Ochs. typically occur around vegetated margins of gravel pits on the coast.

Miscellaneous Activities of Man.

I have discussed the more significant activities that have led to the presence of freshwater habitats in Southeastern England. Artificial bodies of water have also been created for other reasons.

Dew ponds have been constructed on the downs for the purpose of watering cattle (FOSTER, 1972). Cattle troughs sometimes contain species of *Helophorus,* together with *Hydroporus planus* (F.), *H. pubescens* (Gyllenhal), *H. tessellatus* Drapiez, and *H. discretus.* Ornamental and recreational pools as well as fishponds have also been constructed, especially on some of the large estates in Victorian times. A specimen of

Laccobius simulator D'Orchymont was found in a recently constructed outdoor swimming pool at Darvell, East Sussex, by E. Phillips, confirming the suspected presence of the species in Britain (Foster & Phillips, 1983). The pool has a clay bottom and concrete sides, and contained other members of the genus.

Mr. Phillips had also discovered *Haliplus varius* Nicolai new to Britain in a nearby locality some time earlier. This species occurred quite abundantly in a fishpond that had been formed by the damming of a stream (Parry, 1983).

Limited areas of freshwater have been created in parts of East Kent by mining subsidence, but this is by no means as extensive as on some of the larger coalfields of Northern England.

Other bodies of water have been formed by excavations for military purposes. The earliest of these are represented by castle moats, of which there are several in Southeast England. *Hydrophilus piceus* is abundant in the moat at Pevensey Castle (Foster, pers. comm.). Flooded dugouts and artillery implacements on Ashdown Forest contribute towards the little stagnant water that is present in that area. Bomb craters and emergency supply water tanks support larger species, particularly *Acilius sulcatus* (L.). The Royal Military Canal, extending from Pett in East Sussex to Hythe in Kent, has also provided a distributional waterway for aquatic Coleoptera.

Conclusions

Despite the extinction of some species and decline of others in the Southeast due to the effects of arable farming, it would appear that some commercial activities, particularly quarrying, have greatly assisted certain beetles to increase their distribution.

Page (1908) reported *Hydrochara caraboides* (L.) as common in Kent. The same species has since become extinct in the Southeast, its range having declined in Britain generally, being now confined to the Somerset Levels. Related species such as *Hydrophilus piceus* and *Limnoxenus niger* could eventually follow.

Conversely, the silt pond community and in particular *Coelambus confluens,* has benefited from the extensive quarrying that is still taking place. *C. confluens* was probably a rare species confined to ox-bow lakes, temporary streams, and tidal pools. It flies readily and can withstand conditions few other species would tolerate (Foster, 1983). Man's

activities have no doubt also contributed to the recent Northwest European invasion of *C. nigrolineatus*.

Because of its proximity to the continent, Southeast England is geographically well situated for colonisation by species extending their range from Central and Northwestern Europe. Four species of aquatic Coleoptera new to Britain have been discovered within recent years in habitats that were at least originally man-made. Others could follow, particularly members of the genus *Coelambus*, thereby replacing waning species that are unlikely to reappear.

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